

Chapter 4: Policies & Measures

1. INTRODUCTION

Over the past four years, the United States has taken a series of important steps that will reduce the harmful emissions that contribute to climate change, improve public health, and protect our environment. At the federal level, the United States has made significant progress in reducing greenhouse gas (GHG) emissions, including through establishing historic new fuel economy standards for cars and trucks. Other policies and measures have reduced GHG emissions and consumer energy bills through energy efficiency measures, doubling generation of electricity from wind, solar, and geothermal energy, and improving sustainability for federal facilities. These policies and measures reduce pollution and speed the transition to more sustainable sources of energy, industrial processes, and waste management practices.

Within the United States, several regional, state, and local initiatives complement federal efforts to reduce GHG emissions. These include a wide range of policies that affect the energy and transportation sectors, among many others, from direct regulation of GHGs to policies that indirectly reduce emissions. State and local governments also have unique authorities to address climate change apart from the federal government, particularly in regulating land-use planning decisions. Taken together, state, local, and federal actions create a broad policy framework to reduce emissions and spur investments in cleaner energy and energy efficiency.

Building on important progress achieved during his first term, in June 2013 President Obama released a *Climate Change Action Plan* to further reduce the nation's GHG emissions (EOP 2013). This plan lays out additional executive actions the United States will take—in partnership with states, communities, and the private sector—to meet the ambitious commitment of reducing U.S. GHG emissions in the range of 17 percent below 2005 levels by 2020. The plan includes such steps as establishing the first-ever carbon pollution standards for both new and existing power plants; setting a new goal to once again double electricity generation from wind, solar, and geothermal power; reducing emissions of highly potent hydrofluorocarbons (HFCs); developing a comprehensive methane (CH₄) emission reduction strategy; and efforts to protect America's forests and critical landscapes. Each of these actions is discussed in further detail in the preceding Biennial Report.

This chapter outlines and discusses policies and measures in the following key areas:

- Federal policies and measures, including actions in the transportation, energy, industrial, agricultural, forestry, and waste management sectors, and federal government actions and cross-cutting initiatives.
- Nonfederal policies and measures, including regional, state, and local actions to address climate change.

This 2014 National Communication addresses a broader scope of policies and measures than the preceding Biennial Report.

2. FEDERAL POLICIES AND MEASURES

The United States utilizes a combination of near- and long-term regulatory and voluntary activities for climate mitigation. Policies and measures are being implemented across the economy, including in the transportation, energy supply, energy end use, industrial processes, agricultural, waste, and federal facilities sectors. In addition, the United States utilizes cross-cutting policies and measures to encourage cost-effective reductions across multiple sectors. Although significant GHG reductions have been made through existing initiatives, the United States recognizes that opportunities continue to arise to expand and build upon existing regulatory and voluntary programs for further GHG emission reductions. Table 4-1 summarizes the key new initiatives since the *U.S. Climate Action Report 2010* (2010 CAR) (U.S. DOS 2010), including implementation of several new regulatory policies across the transportation, energy, and industrial (non-carbon dioxide [CO₂]) sectors since 2010.

Table 4-1: Significant New Policies Adopted and Key Implementation Progress Made Since CAR 2010

Sector	Policy/Measure	Description of Activity Since CAR 2010
Transport	National Program for Light-Duty Vehicle GHG Emissions and Corporate Average Fuel Economy Standards	The combined model year (MY) 2012–2025 standards are expected to effectively cut in half vehicle GHG emissions, reducing 6 billion metric tons of GHGs over the lifetimes of the vehicles sold in MYs 2012–2025—more than the total amount of CO ₂ emitted by the United States in 2010.
Transport	National Program for Heavy-Duty Vehicle GHG Emissions and Fuel Efficiency Standards	The MY 2014–2018 standards are expected to significantly reduce GHG emissions and fuel consumption from heavy-duty vehicles. The Heavy-Duty National Program will cut 270 million metric tons (MMT) of GHG emissions during the lifetimes of the vehicles sold in MYs 2014–2018.
Energy (Supply)	Carbon Pollution Standard for Future Power Plants	In March 2012, EPA proposed the first-ever carbon pollution standard for future fossil-fuel power plants. Power plants account for approximately 40 percent of all U.S. CO ₂ emissions, and represent the single-largest source of industrial GHG emissions in the nation.
Energy (Residential, Commercial, Industrial)	Lighting Energy Efficiency Standards	These standards will phase out the 130-year-old incandescent light bulb by the middle of the next decade and phase out less efficient fluorescent tubes. They are estimated to have GHG mitigation potential of 36.3 teragrams (Tg) of carbon dioxide equivalents (CO ₂ e) in 2015 and 37.7 Tg CO ₂ e in 2020.
Energy (Residential, Commercial, Industrial)	Appliance and Equipment Standards	Since 2009, 17 new or updated federal standards have been issued, which will help increase annual energy savings by more than 50 percent over the next decade. Products covered by the standards represent about 90 percent of home energy use, 60 percent of commercial building use, and 29 percent of industrial energy use.
Industrial (Non-CO ₂)	Federal Air Standards for the Oil and Natural Gas Industry	On April 17, 2012, EPA issued cost-effective regulations to reduce harmful air pollution from the oil and natural gas industry, while allowing continued, responsible growth in U.S. oil and natural gas production. These regulatory standards are projected to achieve a significant co-benefit of methane emission reductions, estimated at 32.6 Tg CO ₂ e in 2015 and 39.9 Tg CO ₂ e in 2020.
Cross-cutting	Best Available Control Technology (BACT) for GHG emissions	In May 2010, EPA issued a regulation establishing a common-sense approach to permitting GHG emissions. As of April 2013, EPA and states have issued nearly 90 permits to large industrial sources that cover GHG emissions.

The remainder of this section discusses these and the other new and existing U.S. climate mitigation policies and measures. Policies and measures are organized by sector, listing policies and measures with the most significant effect on GHG mitigation in 2020 within the sector first. See Table 4-2 for estimates of GHG

emission reductions. All efforts contribute directly or indirectly to GHG emission reductions, even though many policies and measures are being advanced for other primary purposes, such as the reduction of other harmful pollutants, to improve sustainability, economic growth, and rural development, and to spur the development and deployment of new technologies. Similar policies and measures are addressed together in some instances, to convey the comprehensive approach being deployed at the federal level. Please refer to Appendix X for descriptions and mitigation estimates of individual measures.

2.1 Transportation Sector

U.S. federal policies and measures to reduce GHGs from the transportation sector leverage a mix of regulatory, voluntary, and informational approaches with the greatest estimated mitigation impact from regulatory instruments. Programs are being implemented across multiple federal agencies to improve vehicle efficiency, increase the use of renewable fuels, and encourage the adoption of new technologies and practices. See Table 4-2 for estimates of GHG emission reductions in the transportation sector.

2.1.1 National Program for Light-Duty Vehicle GHG Emissions and CAFE Standards¹

Responding to the country's critical need to address global climate change and reduce oil consumption, President Obama directed the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Transportation's (DOT's) National Highway Traffic Safety Administration (NHTSA) to work closely together to establish a harmonized National Program for Corporate Average Fuel Economy (CAFE) Standards and GHG standards for light-duty vehicles (LDVs). In April 2010, NHTSA and EPA issued a joint final rule establishing the first phase of standards for model year (MY) 2012–2016 LDVs. The MY 2012–2016 standards are projected to result in an average LDV tailpipe CO₂ level of 250 grams/mile (g/mi) by MY 2016, equivalent to 35.5 miles per gallon (mpg) if achieved exclusively through fuel economy improvements. The standards represent the first time EPA promulgated federal emission standards for GHGs using its authority under the Clean Air Act (CAA).

Building on the success of the first phase of the National Program, on July 29, 2011, President Obama announced the second phase of standards for MY 2017–2025 LDVs. Thirteen automobile manufacturers representing more than 90 percent of U.S. vehicle sales announced their support for the program, as well as the United Auto Workers Union. NHTSA and EPA issued a joint final rule establishing MY 2017–2025 standards in August 2012. The second phase of standards is projected to result in an average industry fleetwide level of 163 g/mi of CO₂ in MY 2025, which is equivalent to 54.5 mpg if achieved exclusively through fuel economy improvements.

The combined MY 2012–2025 standards will effectively cut in half vehicle GHG emissions and double average vehicle fuel efficiency compared to MY 2011 LDVs. The National Program is projected to save American families more than \$1.7 trillion in fuel costs and reduce America's dependence on foreign oil by more than 2 million barrels per day (bpd) in 2025. In addition, the program is expected to cut 6 billion metric tons of GHGs during the lifetimes of the LDVs sold in MYs 2012–2025—more than the total amount of U.S. CO₂ emissions in 2010.

¹ See <http://www.nhtsa.gov/fuel-economy>; and <http://epa.gov/otaq/climate/regs-light-duty.htm>.

The National Program ensures that automobile manufacturers can build a single fleet of U.S. vehicles that satisfy the requirements of both federal and California's emission control programs,² thus helping to reduce costs and regulatory complexity, while providing significant energy security and environmental benefits to the nation as a whole. The program design also ensures that consumers still have a full range of vehicle choices.

The MY 2017–2025 rule includes a mid-term evaluation of the MY 2022–2025 standards that will be undertaken in a few years. The evaluation, which will be based on up-to-date information on technology and cost, could lead the federal agencies to make the standards for MYs 2022–2025 more stringent, less stringent, or unchanged from their current levels.

2.1.2 National Program for Heavy-Duty Vehicle GHG Emissions and Fuel Efficiency Standards³

Heavy-duty vehicles (HDVs) are a significant contributor to GHG emissions and fuel consumption from the U.S. transportation sector. The contribution from these vehicles is second only to LDVs. In May 2010, President Obama directed EPA and NHTSA to develop a joint rulemaking to establish fuel efficiency and GHG emission standards for commercial medium- and heavy-duty on-highway vehicle and work trucks beginning in MY 2014. In September 2011, EPA and NHTSA issued the joint final rule establishing the first phase of standards for MY 2014–2018 HDVs.

The MY 2014–2018 standards are expected to achieve up to a 23 percent reduction in GHG emissions and fuel consumption from HDVs. The Heavy-Duty National Program is estimated to save truck owners more than \$50 billion in fuel costs and reduce America's dependence on oil by more than 530 million barrels. In addition, the program will cut a projected 270 million metric tons (MMT) of GHG emissions over the lifetimes of the vehicles sold in MYs 2014–2018.

2.1.3 Renewable Fuel Standard Program⁴

The Energy Independence and Security Act of 2007 (EISA) made several changes to the Renewable Fuel Standard (RFS) program, which was originally implemented under Energy Policy Act (EPAct) of 2005. These changes included a significant increase in the volume of renewable fuel that must be used in transportation fuel each year. By 2022, 36 billion gallons of renewable fuel are required annually—a fivefold increase over the volumes included in EPAct. The statute also includes volume requirements for biomass-based diesel and other advanced biofuels, including 16 billion gallons of cellulosic biofuel annually by 2022. The revised requirements also include new definitions and criteria for both renewable fuels and the feedstocks used to produce them, including new life-cycle GHG emission thresholds for renewable fuels.

EPA, which issued a final rule in February 2010, is currently implementing the RFS program, including continually increasing the number of pathways (combinations of biofuel feedstock, production technologies,

² California approved an emission control program that reduces GHGs under a single package of standards called Advanced Clean Cars.

³ See <http://www.nhtsa.gov/About+NHTSA/Press+Releases/2011/White+House+Announces+First+Ever+Oil+Savings+Standards+for+Heavy+Duty+Trucks,+Buses>; and <http://www.epa.gov/otaq/climate/regs-heavy-duty.htm>.

⁴ See www.epa.gov/otaq/alternative-renewablefuels.

and fuels produced) as the program matures and opportunities for biofuel production expand. The RFS program is anticipated to achieve significant reductions in both petroleum use and GHGs.

2.1.4 SmartWay Transport Partnership⁵

The SmartWay Transport Partnership is an innovative collaboration with businesses and other stakeholders to decrease climate and other emissions from the movement of goods, by increasing energy efficiency while significantly reducing GHGs and air pollution. EPA provides tools and models to help SmartWay Transport Partners—including shippers and the trucking, rail, and marine shipping companies that deliver their goods—to adopt cost-effective strategies to save fuel and reduce GHG emissions.

To date, more than 3,000 companies and organizations have joined the partnership. Freight shippers meet their goals by selecting the greenest carriers and modes to fit their shipping needs, while trucking and rail companies meet their goals by improving freight transport efficiency.

The SmartWay program is also working with other governments and organizations around the world to establish international benchmarks for clean, efficient freight transportation. In 2012, EPA and Natural Resources Canada announced the expansion of SmartWay into Canada. EPA estimates that SmartWay could help the shipping industry reduce up to 43 Tg CO₂e. by 2020.

Other SmartWay initiatives include the evaluation of fuel-saving technologies and SmartWay designation of efficient heavy-duty trucks and trailers. SmartWay-designated tractor-trailers can save 10–20 percent annually in fuel and CO₂ emissions compared to typical long-haul trucks. SmartWay also promotes idle reduction programs for trucks and locomotives and has developed guidance on idle reduction policies and programs for states. SmartWay's Supply Chain initiative is developing new tools to help companies quantify and track freight transport environmental performance across all modes, including truck, marine, rail, and aviation.

2.1.5 Light-Duty Vehicle Fuel Economy and Environment Label⁶

Building on the EPA's 35-year history of labeling vehicles, EPA and DOT redesigned the Fuel Economy and Environment labels found on all new vehicles. The labels have historically provided information on fuel economy and annual fuel costs that can be compared across all vehicles. The redesigned labels continue this tradition, and additionally provide information on energy use, relative cost of refueling, and environmental ratings for GHGs and smog. The labels can be compared across all new vehicles, including advanced technologies, such as plug-in hybrids and electric vehicles. This information allows the car-buying public to take into account fuel and environmental considerations, including GHG emissions and relative refueling costs.

2.1.6 National Clean Diesel Campaign⁷

⁵ See www.epa.gov/smartway.

⁶ See www.epa.gov/carlabel.

⁷ See www.epa.gov/cleandiesel.

EPA's National Clean Diesel Campaign (NCDC) works aggressively to reduce diesel emissions across the country, through the implementation of proven emission control technologies and innovative strategies with the involvement of national, state, and local partners. Many of the clean diesel strategies that NCDC promotes to mitigate nitrogen oxides (NOx) and particulate matter (PM)—such as retrofits, engine repair, engine replacement, engine repower, idle reduction, and cleaner fuels—can also reduce CO₂ emissions through diesel fuel savings and help mitigate black carbon emissions. Black carbon, a component of PM, has been found to both increase atmospheric warming and speed Arctic melting. Removing PM may have a significant effect on slowing global warming due to the short-lived nature of black carbon.

The Diesel Emissions Reduction Act (DERA) provisions in EPCA are a significant funding source for NCDC. EPA DERA grants fund projects that provide immediate health and environmental benefits. During their lifetime, projects funded in fiscal years (FYs) 2008–2010 are estimated to reduce CO₂ by 2.3 million tons, as well as provide fuel savings of more than 205 million gallons.

2.1.7 Advanced Technology Vehicles Manufacturing Loan Program⁸

DOE's Loan Program Office (LPO) manages the Advanced Technology Vehicles Manufacturing (ATVM) Loan Program, authorized under Section 136 of EISA. ATVM provides direct loans to support reequipping, expanding, or establishing manufacturing facilities in the United States to produce advanced technology vehicles or qualifying components and to support U.S. engineering integration projects. Auto manufacturers and qualifying component manufacturers are eligible to apply for loans. For example, ATVM loans have been used to upgrade and retool several factories across the United States to produce advanced batteries and raise fuel efficiency in over a dozen popular vehicle models.

2.1.8 State and Alternative Fuel Provider Fleet Program⁹

Through its Vehicle Technologies Office (VTO), the U.S. Department of Energy (DOE) manages the State and Alternative Fuel Provider Fleet Program, which aims to reduce U.S. petroleum consumption by building a core market for alternative fuel vehicles (AFVs). The program requires covered fleets owned or controlled by states or by alternative fuel providers either to acquire AFVs as a percentage of their annual LDV acquisitions or to employ other petroleum-reduction methods in lieu of acquiring AFVs.

VTO also supports several key initiatives that accelerate the deployment of clean, cutting-edge advanced highway transportation technologies that reduce petroleum consumption and GHG emissions. The Electric Vehicle Everywhere Grand Challenge, a bold DOE-wide initiative, seeks by 2022 to make the United States the first country to produce a wide array of plug-in electric vehicle models that are as affordable and convenient as the gasoline-powered vehicles we drive today. A companion Workplace Charging Challenge will encourage private-sector leadership in the deployment of convenient plug-in vehicle charging for consumers.

2.1.9 Aviation Low Emissions, Fuel Efficiency, and Renewable Fuels Measures¹⁰

⁸ See https://lpo.energy.gov/?page_id=43.

⁹ See <http://www1.eere.energy.gov/vehiclesandfuels/epact/about.html>; and http://www1.eere.energy.gov/vehiclesandfuels/electric_vehicles/index.html.

The Federal Aviation Administration (FAA) is pursuing a comprehensive approach to reduce GHG emissions from commercial aviation through aircraft and engine technology development, operational improvements, development and deployment of sustainable alternative jet fuels, and additional policies and measures. FAA's Next Generation Air Transportation System Plan, or NextGen, focuses its efforts on increasing efficient aircraft operations and reducing GHG emissions through airspace, operational, and infrastructure improvements.

FAA funds diverse programs to improve aviation energy and emissions performance, and coordinates with other agencies as appropriate, including the National Aeronautics and Space Administration. Following are some examples of FAA programs:

- The Continuous Lower Energy, Emissions, and Noise program is a collaborative partnership between FAA and five aviation manufacturers to develop technologies that will reduce emissions and fuel burn, and expedite the integration of these technologies into current aircraft;
- The Aviation Climate Change Research Initiative measures and tracks fuel efficiency from aircraft operations to help assess improvements in aircraft and engine technology, operational procedures, and the airspace transportation system that reduce aviation's contribution to CO₂ emissions.
- The Voluntary Airport Low Emissions Program (VALE) is a grant program that encourages airport sponsors to use Airport Improvement Program funds and Passenger Facility Charges to finance low-emission vehicles, refueling and recharging stations, gate electrification, and other airport air quality improvements. Under FAA's most recent reauthorization, VALE's work is supplemented by new programs that reduce airport emissions. FAA is creating a program where, following an assessment of airport energy requirements, FAA may make capital grants for airports to increase energy efficiency. FAA has also established a pilot program under which certain airports may acquire and operate zero-emission vehicles.

In addition, FAA is a founding member of the Commercial Aviation Alternative Fuels Initiative (CAAIFI). CAAIFI is a public-private partnership established in 2006 with the objective of advancing alternative jet fuels with equivalent safety/performance (drop-in) and comparable cost, environmental improvement, and security of energy supply for aviation. Work through CAAIFI has also expanded internationally. Fuel production capability is beginning to emerge, including a recently announced airline and fuel producer agreement.

2.1.10 Federal Transit, Highway, and Railway Programs¹¹

DOT's Federal Transit Administration (FTA) provides more than \$10 billion a year in grants for the construction and operation of a range of transit services. While specific statutory authority for clean fuel buses and transit investments for GHG reductions was not continued as distinct programs in the surface transportation reauthorization (Moving Ahead for Progress in the 21st Century Act [MAP-21]), FTA continues to support the

¹⁰ See http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=10112; http://www.faa.gov/about/office_org/headquarters_offices/apl/enviro_policy_guidance/policy/media/Aviation_Greenhouse_Gas_Emissions_Reduction_Plan.pdf; and <http://www.faa.gov/airports/environmental/vale/>.

¹¹ See <http://www.fta.dot.gov/>; <http://www.fta.dot.gov/documents/PublicTransportationsRoleInRespondingToClimateChange.pdf>; <http://www.fra.dot.gov/Page/P0128>; http://www.fta.dot.gov/grants_14835.html; <http://www.fhwa.dot.gov/map21/cmaq.cfm>; http://www.fta.dot.gov/13835_12125.html; http://www.fta.dot.gov/12351_11424.html; and <http://www.dot.gov/tiger>.

deployment of a range of advanced mitigation technologies for vehicles and stations, including hybrid and clean fuel transit buses, under its new authorities (Box 4-1).

Through its technical assistance efforts focused on transportation planning and transit-oriented development, FTA provides communities with the tools to effectively coordinate land-use and public transportation investment decisions. FTA also provides environmental management systems training to help transit agencies reduce the environmental impact of their operations. FTA's extensive research, development, and deployment program works to improve the efficiency and sustainability of public transportation, including supporting the demonstration and deployment of low-emission and no-emission vehicles to promote clean energy and improve air quality.

Administered by DOT's Federal Highway Administration and FTA, in consultation with EPA, the Congestion Mitigation and Air Quality Improvement Program apportions funds to states to reduce congestion and to improve air quality through transportation control measures and other transportation strategies that will contribute to attainment or maintenance of the national ambient air quality standards for ozone, carbon monoxide, and PM. Many of these projects also provide GHG emission reductions co-benefits. The projects vary by region, but typically include transit improvements, alternative fuel programs, shared-ride services, traffic flow improvements, demand management strategies, freight and intermodal facilities, diesel engine retrofits, pedestrian and bicycle programs, and inspection and maintenance programs.

DOT also uses available funding sources and opportunities to promote the development of improved passenger rail and the efficiency of freight rail transportation in the United States, notably through the Transportation Investment Generating Economic Recovery (TIGER) discretionary grant program. In addition, the Federal Rail Administration's Railroad Rehabilitation and Improvement Financing (RRIF) program authorizes up to \$35 billion in direct loans and loan guarantees to improve or rehabilitate railroads. A recent RRIF loan of \$54.6 million to Kansas City Southern Railway Company is enabling purchase of low-emission locomotives.

Box 4-1: Moving Ahead for Progress in the 21st Century Act

Significant legislative activity occurred in the transportation sector, affecting many of the federal climate mitigation measures implemented by DOT. On July 6, 2012, President Obama signed into law the Moving Ahead for Progress in the 21st Century Act (MAP-21),¹² the first long-term highway authorization enacted since 2005. MAP-21 is a milestone for the U.S. economy and the nation's surface transportation program. By transforming the policy and programmatic framework for investments to guide the transportation system's growth and development, MAP-21 creates a streamlined and performance-based surface transportation program and builds on many of the highway, transit, bike, and pedestrian programs and policies established in 1991.

2.2 Energy Sector: Supply

Within the energy sector, numerous federal policies and measures are being implemented to reduce CO₂ emissions from energy supply sources, while also encouraging greater renewable energy resources. A mix of

¹² See Public Law (P.L.) 112-141.

regulatory, economic and regulatory instruments is being leveraged across multiple federal agencies. See Table 4-2 for estimates of GHG emission reductions in the energy sector.

2.2.1 Carbon Pollution Standard for Future Power Plants¹³

The President has directed EPA to work closely with states and other stakeholders to establish carbon pollution standards for both new and existing power plants. EPA is moving forward on the President's plan. For newly built power plants, EPA issued a new proposal on September 20, 2013. Issuance of the new proposal, together with the ensuing rulemaking process, will ensure that carbon pollution standards for new power plants reflect recent developments and trends in the power sector. The new proposal, comment period, and public hearings will allow an open and transparent review and robust input on the broad range of technical and legal issues contained among the more than 2.5 million comments generated by the first proposal submitted by EPA in April 2012. For existing power plants, the plan directs EPA to issue a draft rule by June 2014 and a final rule by June 2015.

2.2.2 Clean Energy Supply Programs¹⁴

Through the Clean Energy Supply Programs, EPA offers technical resources, develops nationally accepted standards, provides access to expertise, and recognizes environmental leadership. In turn, partner investments in clean energy yield significant environmental benefits by reducing GHG emissions and other air pollutants. EPA's Green Power Partnership (GPP) encourages U.S. organizations to voluntarily purchase green power, offers recommended minimum levels of purchasing, and provides partners with information and recognition for their purchases and on-site renewable power systems. The program includes nearly 1,400 partners who have committed to purchasing about 25 billion kilowatt-hours of green power. In addition, the program recognizes towns, villages, cities, counties and tribal governments that collectively buy green power in amounts that meet or exceed EPA's GPP community purchase requirements. These Green Power Communities also compete through an annual Green Power Community Challenge, which aims to increase the amount of green power used by communities nationwide.

The Combined Heat and Power Partnership (CHPP) reduces the environmental impact of power generation by encouraging the use of combined heat and power (CHP), an efficient, clean, and reliable approach to generating power and thermal energy from a single fuel source. Through the CHPP, EPA works closely with stakeholders to support the development of new projects, by providing tools and information resources, and to promote their energy, environmental, and economic benefits. The program now includes more than 450 partners and has assisted in the deployment of over 5,500 megawatts (MWs) of operational CHP. CHPP works to support balanced treatment of CHP in new or modified environmental regulations and documents, such as state and tribal air quality planning resources and output-based regulations.

2.2.3 Onshore Renewable Energy Development Programs¹⁵

¹³ See <http://epa.gov/carbonpollutionstandard/basic.html>.

¹⁴ See <http://www.epa.gov/greenpower>; and <http://www.epa.gov/CHP>.

The U.S. Department of the Interior (DOI) and their Bureau of Land Management (BLM) are working with communities, state regulators, industry, and other federal agencies in building a clean energy future by providing sites for environmentally sound development of renewable energy on public lands. Renewable energy projects on BLM-managed lands include wind, solar, geothermal, and biomass projects and the siting of transmission facilities needed to deliver this power to the consumer. As of May 2013, the BLM has approved 61 solar and wind energy projects with a total installed capacity of 1,421 MWs, and another 11,000 MWs under construction.

The BLM also managed 816 geothermal leases through its Geothermal Energy Development Program, of which 72 leases are in producing status and generating approximately 1,300 MWs of capacity. In 2013, BLM issued a regulation that allows for the segregation of lands from mining claim entry that will facilitate right-of-way applications for lands with wind and solar energy development potential. The BLM also released additional guidance documents for developing renewable energy projects on public lands, such as Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities. The BLM is also working on proposed regulations that will establish a competitive leasing process for offering lands within designated leasing areas (e.g., solar energy zones) for future solar or wind energy development.

2.2.4 The Rural Energy for America Program¹⁶

USDA's Rural Energy for America Program (REAP) provides assistance to agricultural producers and rural small businesses to complete a variety of projects. By offering both loan guarantees and grants, REAP helps eligible applicants install energy systems, such as solar panels or anaerobic digesters; make energy efficiency improvements, such as installing irrigation pumps or replacing ventilation systems; and conduct energy audits and feasibility studies. More than 8,500 projects have been completed, which have reduced the demand for fossil fuels from conventional GHG-emitting sources. In addition, the REAP program has reduced GHG emissions by helping to install wind, geothermal, solar, small hydro, and anaerobic digester projects.

2.2.5 Carbon Capture and Storage Demonstration Plants and Large-Scale Geologic Storage Cooperative Agreements¹⁷

By supporting research and development, demonstration, and deployment activities, DOE's Office of Fossil Energy seeks to reduce the cost of carbon capture and storage (CCS) technology. DOE currently supports eight large-scale power plant and industrial (CCS) demonstration plants, three of which are under construction, and eight large-scale geologic storage cooperative agreements, four of which have reached the CO₂ injection stage. Cooperative agreements are a cost-shared collaboration between the federal government and private industry,

¹⁵ For solar, see http://www.blm.gov/wo/st/en/prog/energy/solar_energy.html; for geothermal, see <http://www.blm.gov/wo/st/en/prog/energy/geothermal.html>; for wind, see http://www.blm.gov/wo/st/en/prog/energy/wind_energy.html.

¹⁶ See <http://www.rurdev.usda.gov/energy.html>.

¹⁷ See <http://www.fe.doe.gov/programs/powersystems/futuregen/index.html>; <http://www.fe.doe.gov/recovery/projects/ccpi.html>; and http://www.fe.doe.gov/programs/sequestration/industrial/industrial_ccs.html.

aimed at stimulating investment in low-emission coal-based power generation technology through successful commercial demonstrations. To reduce the cost of CO₂ capture and compression, which is responsible for at least 80 percent of the added cost of CCS technology, DOE seeks to demonstrate and enable the deployment of second-generation CCS technologies during the 2020s, and transformational technologies during the 2030s.

2.2.6 Rural Development Biofuels Programs¹⁸

Several U.S. Department of Agriculture (USDA) programs support the development of new and emerging technologies for refining advanced biofuels and utilizing renewable biomass as an energy feedstock. The Advanced Biofuel Payment Program, for example, provides payments to biorefineries to maintain and expand production of advanced biofuels (i.e., biofuels refined from renewable feedstocks other than corn kernel starch, such as cellulose, sugar, hemicelluloses, lignin, waste materials, and biogas). Similarly, the Biorefinery Assistance Program (BAP) supports the emerging commercialization of next-generation advanced biofuel facilities, plants capable of producing fuel and bio-products using nonedible feedstocks and organic wastes. BAP also emphasizes production of advanced biofuels, but focuses on facilities that produce at commercial scale. Finally, the Repowering Assistance Program (RAP) provides payments to eligible biorefineries to help offset the costs of converting existing fossil fuel refineries to renewable biomass fuel-powered systems.

While USDA's biofuels programs are primarily designed to promote energy independence and rural development, they reduce GHG emissions associated with energy production and/or fossil fuel use. For example, a large-scale anaerobic digester funded through RAP supplies enough biogas to a nearby ethanol plant to replace virtually all the fossil fuels previously used to power the refinery process.

2.2.7 Biofuel Regional Feedstock Partnerships¹⁹

Through such efforts as the Regional Feedstock Partnerships, DOE's Bioenergy Technologies Office is working to identify and analyze feedstock supply and regional logistics and conduct crop field trials in order to address barriers associated with the development of a sustainable and predictable supply of biomass feedstocks. In addition, DOE's Bioenergy Technologies Office is working through public-private, cost-sharing partnerships to address critical challenges in the deployment of technologies for integrated biorefineries. These partnerships undertake biorefinery projects to prove the viability of various feedstock and conversion pathways and reduce the associated technical and financial risks. Currently, DOE has awarded funds to 22 biorefinery projects.

2.2.8 Smart Grid Investment Grants²⁰

As a result of the American Recovery and Reinvestment Act of 2009 (ARRA), DOE's Office of Electricity is applying approximately \$9 billion toward the modernization of the electric grid in 131 Smart Grid Investment Grant projects around the country through public-private partnerships. The projects are deploying smart grid

¹⁸ See <http://www.rurdev.usda.gov/MN-RBS-AdvancedBiofuelPaymentProgram.html>; http://www.rurdev.usda.gov/BCP_biorefinery.html; and http://www.rurdev.usda.gov/bcp_repoweringassistance.html.

¹⁹ See <http://www.sungrant.org/Feedstock+Partnerships/>; http://www1.eere.energy.gov/biomass/integrated_biorefineries.html; and http://www1.eere.energy.gov/bioenergy/pdfs/ibr_portfolio_overview.pdf.

²⁰ See <http://energy.gov/oe/technology-development/smart-grid/recovery-act-smart-grid-investment-grants>.

technologies (e.g., automated controls on field devices, meters, sensors, communications infrastructure, consumer monitoring technology) within the transmission and distribution (T&D) systems and on customers' premises. Significant energy efficiency improvements are expected primarily by demand reduction by customers, more efficient field operations, and optimized control of voltage and reactive power. In addition, significant resources are focused on coordinating transmission system planning and advancing energy storage technologies, as well as computational methods of grid modeling, to more effectively integrate renewable energy technologies into the electric grid, and to reduce the environmental footprint of energy generation and delivery.

2.2.9 Offshore Renewable Energy Program—Bureau of Ocean Energy Management²¹

The Outer Continental Shelf (OCS) has significant potential as a source of new domestic energy generation from renewable energy resources. In the foreseeable future, DOI's Bureau of Ocean Energy Management (BOEM) anticipates development of renewable energy on the OCS from three general energy sources: offshore wind, ocean waves, and ocean currents.

BOEM has achieved significant progress with respect to offshore wind development in the recent years. In 2009, President Obama and Secretary of the Interior Salazar announced the final regulations for the OCS Renewable Energy Program, providing a framework for the issuance of renewable energy leases, easements, and rights-of-way. In November 2010, Secretary Salazar signed the nation's first commercial lease for wind energy development on the OCS for the Cape Wind Energy Project offshore Massachusetts. In late 2012, BOEM issued a commercial lease for a wind facility offshore Delaware. In 2013, BOEM announced the first competitive offshore lease sales for areas offshore Virginia, Rhode Island, and Massachusetts, and plans to announce additional competitive sales for a number of areas, including areas offshore New Jersey, Maryland, and Massachusetts.

Planning and environmental work continues on a number of unsolicited proposals for wind facilities and renewable energy transmission lines along the East Coast. BOEM is also working toward authorizing wind development off the Pacific Coast (e.g., offshore Oregon and Hawaii) and marine hydrokinetic testing activities offshore Florida and Oregon.

2.2.10 Price Anderson and the Nuclear Waste Policy Act²²

DOE has legal responsibility to manage nuclear waste under the Nuclear Waste Policy Act. DOE's Office of Nuclear Energy also provides funding for the SMR (Small Modular Reactor) Licensing Technical Support program, which is a cost-share program with industry to help complete design efforts that will enable SMRs to be evaluated by the Nuclear Regulatory Commission.

²¹ See <http://www.boem.gov/Renewable-Energy-Program/index.aspx>.

²² See <http://energy.gov/downloads/strategy-management-and-disposal-used-nuclear-fuel-and-high-level-radioactive-waste>; and <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/funds-fs.html>.

The Price-Anderson Act of 1957 (PAA) supports the deployment of nuclear power by limiting the total liability a nuclear plant operator would face in the event of an accident. This cap has enabled an insurance system for individual owners and the industry as a whole to manage financial risks. Without the PAA, no nuclear plants would be built in the United States. Nuclear power plants do not produce CO₂ emissions as part of the power-generating process.

Box 4-2: Climate Mitigation Co-Benefits of Legal Actions

As part of legal actions to address CAA compliance issues at electric power plants, EPA and U.S. Department of Justice may also include requirements to remedy, reduce, or offset harm caused by pollution previously emitted by power plants. Many of these actions provide climate mitigation co-benefits if they require investing in measures, such as renewable energy and end-use energy efficiency. For example, the settlement with the Tennessee Valley Authority (TVA) requires TVA to spend \$350 million on environmental mitigation projects to address the impacts of past nitrogen oxide and sulfur dioxide emissions. Of this amount, TVA is allocating \$280 million to energy efficiency and renewable energy programs, which TVA estimates will provide 30 million tons of CO₂ emission reduction co-benefits.²³

2.3 Energy Sector: Residential, Commercial, and Industrial End Use

Reducing how much energy is used in homes, buildings, and industrial facilities is also critical to supporting efforts to reduce GHG emissions from the energy sector. At the federal level, DOE and EPA continue to make great progress implementing programs to increase energy efficiency through regulatory, voluntary, and economic instruments. See Table 4-2 for estimates of GHG emission reductions in the residential, commercial, and industrial end-use sectors.

2.3.1 Appliance and Equipment Energy Efficiency Standards²⁴

(insert Box 4-3 near this section on appliance standards.)

DOE's BTO also implements minimum energy conservation standards for more than 50 categories of appliances and equipment in the residential, commercial, and industrial sectors. As a result of these standards, energy users saved about \$40 billion on their utility bills in 2010. Since the 2010 CAR, 17 new or updated federal standards have been issued, which will help increase annual savings by more than 50 percent over the next decade. Products covered by standards represent about 90 percent of home energy use, 60 percent of commercial building use, and 29 percent of industrial energy use. Commercial and industrial standards were issued for air conditioners, heat pumps, ice makers, refrigerators, freezers, clothes washers, electric motors, boilers, and transformers. Residential standards were issued for boilers, dehumidifiers, cooking products, direct heating equipment, dishwashers, air conditioners, refrigerators, freezers, clothes washers and dryers, among others.

2.3.2 ENERGY STAR-Labeled Products²⁵

²³ See <http://www.epa.gov/enforcement/air/cases/tvacoal-fired.html>.

²⁴ See https://www1.eere.energy.gov/buildings/appliance_standards/.

²⁵ See <http://www.energystar.gov>.

As a national symbol for energy efficiency, ENERGY STAR makes it easy for consumers and businesses to purchase products that save them money and reduce GHGs. The program celebrated its 20th anniversary in 2012, with Americans purchasing more than 4.5 billion products across over 65 product categories. The level of public awareness of ENERGY STAR has increased to more than 85 percent of American households due to a combination of strategic efforts, including maintaining brand integrity, consumer education and outreach, and third-party verification and testing of products.

With support from DOE, EPA continues to identify new product categories for ENERGY STAR, as well as revise existing product specifications to more stringent levels. The ENERGY STAR qualification process requires that products be tested in EPA-recognized laboratories, with the results reviewed by an independent, accredited certification organization. EPA also continues to expand its new ENERGY STAR[®] Most Efficient recognition program, to increase demand for products that demonstrate cutting-edge efficiency.

2.3.3 ENERGY STAR Commercial Buildings²⁶

EPA has continued to expand the ENERGY STAR program in the commercial market, offering thousands of businesses and other organizations a strategy for superior energy management, standardized measurement tools, and recognition for their efforts. More than 20,000 buildings have earned the ENERGY STAR label for top performance, and are using 35–40 percent less energy than average buildings. Since the 2010 CAR, EPA has expanded ENERGY STAR to include 16 different space types eligible to earn the certification, including senior care facilities and data centers.

In addition, approximately 40 percent of U.S. floor space has been rated using EPA’s ENERGY STAR Portfolio Manager[™] building tracking tool. Introduced in 1999, Portfolio Manager[™] benchmarks the energy use of commercial buildings to help owners, facility managers, and tenants evaluate building energy efficiency and identify cost-effective opportunities for improvements. Unveiling the largest U.S. building energy benchmarking data analysis to date, EPA examined more than 35,000 buildings that consistently used the ENERGY STAR Portfolio Manager[™] measurement tool from 2008 to 2011. The buildings showed an average of 7 percent energy savings and 6 percent GHG emission reductions over three years—with the buildings that were initially the lowest performers making the greatest improvements. In addition to this analysis, EPA released a series of ENERGY STAR Portfolio Manager Data Trends in 2012.²⁷

2.3.4 Lighting Energy Efficiency Standards²⁸

DOE’s Building Technologies Office (BTO) implements lighting energy efficiency standards mandated by EISA. The standards will result in phasing out the 130-year-old incandescent light bulb by the middle of the next decade and phases out less efficient fluorescent tubes. New standards will also apply to reflector lamps—the cone-shaped bulbs used in recessed and track lighting.

²⁶ See <http://www.energystar.gov>.

²⁷ See <http://www.energystar.gov/datatrends>.

²⁸ See https://www1.eere.energy.gov/buildings/appliance_standards/.

Box 4-3: Assessing the Welfare Benefits of Policy Measures

The U.S. government analyzes the anticipated economic effects of its proposed standards and policies. A key element of these analyses has been the estimation of the potential economic and human welfare benefits of reduced GHGs. Specifically, federal agencies use a metric known as the social cost of carbon (SCC) to estimate the dollar value of the benefits of regulatory actions that affect CO₂ emissions.

The SCC is a present value calculation of the avoided worldwide damages—e.g., the benefits associated with a 1-ton decrease in CO₂ emissions in a particular year—and thus the value of the benefits from a commensurate reduction in emissions. It is meant to be a comprehensive measure, including losses due to changes in net agricultural productivity, human health risks, property damages from increased flood risk, and the loss of ecosystem services.

In 2010, in an effort to promote consistency in how Federal agencies calculate the social benefits of reducing CO₂ emissions, the U.S. government selected four SCC values for use in regulatory analyses. These values were first used in DOE's energy conservation standards for small motors in 2010. The U.S. government updated its SCC estimates in 2013 to reflect how climate change impacts are represented in the latest peer-reviewed versions of the three academic models from which the SCC is estimated.²⁹ The four SCC estimates for the 2020 are: \$13, \$46, and \$69 per metric ton (average SCC at discount rates of 5, 3, and 2.5 percent, respectively) and \$138 per metric ton (95th percentile SCC at a 3 percent discount rate) in 2011 dollars.

2.3.5 ENERGY STAR for Industry³⁰

EPA's ENERGY STAR for Industry program has continued to grow since the 2010 CAR. EPA's ENERGY STAR Industries in Focus, which directly address barriers to energy efficiency by providing industry-specific energy management tools and resources, have grown to include 24 industrial sectors and subsectors with the launch of the integrated pulp and paper mills in 2012. Energy-efficient industrial plants can earn the ENERGY STAR label by achieving energy performance in the top quartile nationally for their industry.

By 2012, EPA had awarded the ENERGY STAR label to more than 120 plants. EPA continues to expand the use of ENERGY STAR tools and reassess energy performance across sectors. Further, the 2012 ENERGY STAR Challenge engaged a record number of industrial sites that committed to plant-specific energy savings goals, with 75 sites meeting or exceeding their targets of achieving a 10 percent reduction in energy intensity.

2.3.6 ENERGY STAR Certified New Homes³¹

²⁹ http://www.whitehouse.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf

³⁰ See <http://www.energystar.gov>.

³¹ See <http://www.energystar.gov>.

Through ENERGY STAR, EPA works to increase the energy efficiency of new homes to cost-effectively reduce GHG emissions, while lowering Americans' utility bills and improving the comfort of their homes. More than 1.4 million ENERGY STAR-certified new homes have been built to date, with more than 100,000 ENERGY STAR new homes in 2012. More rigorous requirements for new homes to earn the ENERGY STAR label became fully effective in 2012, requiring homes that earn the ENERGY STAR label to be at least 15 percent more energy efficient than homes built to the 2009 International Energy Conservation Code (IECC). The new specifications also feature additional measures that deliver a total energy efficiency improvement of up to 30 percent compared to typical new homes.

In 2011, new and substantially rehabilitated multifamily high-rise buildings became eligible to earn the ENERGY STAR label. These buildings must meet EPA's energy efficiency guidelines and must be designated to be at least 15 percent more efficient than the buildings energy code. As of 2012, 40 multifamily high-rise buildings containing more than 3,800 individual units have been certified.

2.3.7 Home Performance with ENERGY STAR³²

DOE's Home Performance with ENERGY STAR (HPwES) program provides homeowners with resources to identify trusted contractors that can help them understand their home's energy use, as well as identify home improvements that increase energy performance. Contractors that participate in HPwES are qualified by local sponsors, such as utilities, state energy offices, and other organizations, to ensure that they can offer high-quality, comprehensive energy audits. More than 300,000 residential retrofits have been completed to date.

2.3.8 Building Energy Codes³³

DOE's Building Energy Codes Program (BECP) participates in the development of cost-effective building energy codes and provides technical support for adoption and compliance strategies. Through advancing building codes, DOE's BTO aims to improve building energy efficiency by 50 percent, and to help states achieve 90 percent compliance with their energy codes. Building energy code tools and resources include the current status of state energy codes, procedures and tools, technical assistance, commercial compliance software (COMcheck), residential compliance software (REScheck), and reference guides. BECP also provides technical assistance to states and localities as they adopt and enforce energy codes and establish regulations for energy efficiency in federal buildings and manufactured housing.

Additional DOE programs that promote building energy efficiency include the Better Buildings Alliance, which allows members in different market sectors to join DOE's exceptional network of commercial buildings research and technical experts. The Better Buildings Neighborhood Program is helping more than 40 competitively selected state and local governments develop sustainable programs to upgrade the energy efficiency of more than 100,000 buildings. Finally, DOE's Challenge Home Program is a new home construction program that recognizes builders who construct homes to the highest level of energy performance. The program provides voluntary guidelines, which achieve a minimum of 40 percent energy savings above the

³² See <http://www1.eere.energy.gov/buildings/residential/energystar.html>.

³³ See <http://www1.eere.energy.gov/buildings/codes.html>; and <http://energy.gov/better-buildings>.

2009 IECC. By 2017, the program aims to achieve a 10 percent incorporation rate of these voluntary standards in newly constructed U.S. housing.

2.3.9 Regional Clean Energy Application Centers and Industrial Assessment Centers³⁴

Through its Advanced Manufacturing Office, DOE funds Regional Clean Energy Application Centers and Industrial Assessment Centers (IACs) to provide technical assistance, including energy audits, to increase energy efficiency and reduce costs for CHP plants and industrial processes, respectively. An average IAC assessment identifies about \$55,000 in potential annual savings per manufacturer. More than 15,000 IAC assessments have been conducted.

Industrial energy efficiency is also promoted through the following programs at DOE.

- Superior Energy Performance provides a transparent system for verifying improvements in energy performance and management practices through application of the internationally accepted ISO (International Organization for Standardization) 50001 energy management standard.
- The Better Buildings Initiative seeks to make commercial and industrial buildings 20 percent more energy efficient by 2020 and accelerate private-sector investment in energy efficiency.
- The Better Plants Program is designed to encourage and recognize U.S. companies that are raising the bar for all manufacturing facilities by establishing and achieving ambitious energy efficiency goals. Companies joining the program sign a voluntary pledge to reduce energy intensity by 25 percent over 10 years and receive national recognition for their commitment and progress.

2.3.10 Energy Information Administration³⁵

DOE's Energy Information Administration (EIA) collects and publishes definitive, national end-use consumption data for commercial buildings, residential buildings, and manufacturing establishments. The end-use consumption surveys provide baseline information critical to understanding energy use and serve as the basis for benchmarking and performance measurement for energy efficiency programs that provide policymakers with the tools to develop mitigation policies.

The Residential Energy Consumption Survey (RECS) collects information from a nationally representative sample of housing units, including data on energy characteristics of homes, usage patterns, and household demographics. This information is combined with data from energy suppliers to estimate energy costs and usage for heating, cooling, appliances, and other end uses, and is critical to meeting future energy demand and improving building efficiency and design. The Commercial Buildings Energy Consumption Survey (CBECS) provides the only statistically reliable source of energy consumption, expenditures, and end uses in U.S. commercial buildings. CBECS is the only survey conducted by the U.S. government that collects data specifically about commercial buildings. The Manufacturing Energy Consumption Survey (MECS) is a national

³⁴ See <http://www1.eere.energy.gov/manufacturing/distributedenergy/ceacs.html>;
http://www1.eere.energy.gov/manufacturing/tech_deployment/iacs.html;
http://www1.eere.energy.gov/manufacturing/tech_assistance/sep.html; and
http://www1.eere.energy.gov/manufacturing/tech_deployment/betterplants/.

³⁵ See www.eia.gov.

sample survey that collects information on U.S. manufacturing establishments' energy consumption and expenditures, "nonfuel" use of energy sources, end uses, and other characteristics related to their use of energy.

The surveys mentioned above are conducted on a quadrennial basis. The most recent RECS data, for reference year 2009, have been posted on EIA's Web site over the last several years. Processing for CBECS 2012 is well underway, with preliminary data scheduled for release in FY 2014. MECS has been updated since the 2010 CAR with 2010 data. EIA is currently exploring ways to improve the energy consumption survey program by testing and implementing recommendations from a 2012 National Academies of Science study³⁶ aimed at streamlining survey operations and improving data timeliness.

EIA also provides regional and state data, including energy-related CO₂ emissions by state. These data provide input for an analysis of key emission factors by state, including energy intensity, the carbon intensity of the energy supply, and per capita emissions. The analysis has been performed on 2009 and 2010 data. In July 2013, EIA released the *State Energy Efficiency Program Evaluation Inventory*, which provides cost information for state-mandated energy efficiency program evaluations—e.g., for use in updating analytic and modeling assumptions used by EIA (U.S. DOE/EIA 2013i). The National Energy Modeling System is a key source of the projections presented in Chapter 5 of this report.

2.4 Industrial Processes (Non-CO₂)

In addition to CO₂ emissions from energy use, the industrial sector contributes to CH₄ and fluorinated GHG emissions. Federal policies and measures are being implemented by EPA to reduce non-CO₂ emissions from various industries, utilizing a mix of regulatory, voluntary, and informational instruments. See Table 4-2 for estimates of non-CO₂ GHG emission reductions from industrial processes.

2.4.1 Federal Air Standards for the Oil and Natural Gas Industry³⁷

On April 17, 2012, EPA issued regulations to reduce harmful air pollution from the oil and natural gas industry, while allowing continued, responsible growth in U.S. oil and natural gas production. The final rules include the first federal air standards for natural gas wells that are hydraulically fractured, along with requirements for several other sources of pollution in the oil and gas industry that currently are not regulated at the federal level. These other emission sources include storage vessels, pneumatic controllers, centrifugal compressors, reciprocating compressors, and equipment leaks at natural gas processing plants.

The final rules are expected to yield a nearly 95 percent reduction in volatile organic compound (VOC) emissions from more than 11,000 new hydraulically fractured gas wells each year. This significant reduction would be accomplished primarily through capturing natural gas that currently escapes into the air, and making that gas available for sale. Emissions of VOCs react with NO_x in the presence of sunlight to form ground-level ozone, commonly known as "smog." The rules also will reduce air toxics, which are known or suspected of

³⁶ http://www.nap.edu/catalog.php?record_id=13360. Title; Effective Tracking of Building Energy Use: Improving the Commercial Buildings and Residential Energy Consumption Surveys (2012) Authors: William F. Eddy and Krisztina Marton, Editors; Panel on Redesigning the Commercial Buildings and Residential Energy Consumption Surveys of the Energy Information Administration; National Research Council

³⁷ See <http://www.epa.gov/airquality/oilandgas/actions.html>.

causing cancer and other serious health effects. Although these rules specifically regulate VOC and air toxics, they significantly reduce CH₄ emissions, estimated at 32.6 Tg CO₂e in 2015 and 39.9 Tg CO₂e in 2020, as a co-benefit of the VOC control.

2.4.2 Significant New Alternatives Policy Program³⁸

Through its Significant New Alternatives Policy (SNAP) Program, EPA evaluates and regulates substitutes for the ozone-depleting chemicals that are being phased out nationally under the CAA and globally under the Montreal Protocol on Substances that Deplete the Ozone Layer. EPA evaluates a number of criteria in order to list as acceptable those alternatives that reduce overall risk to human health and the environment, while placing restrictions or bans on others, thereby allowing for a safe and smooth transition. The SNAP Program lists are continually being revised and consider the comparative risk of available and potentially available alternatives for a given use.

Since the 2010 CAR, SNAP has continued to identify substitutes for chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and other ozone-depleting substances (ODS). EPA has worked closely with industry to research, identify, and implement climate- and ozone-friendly alternatives, supporting a smooth transition to these new technologies. Many compounds with low global warming potentials (GWPs) have been found acceptable under SNAP, allowing for the uptake of such chemicals in place of both ODS and fluorinated GHGs, such as HFCs.

2.4.3 Natural Gas STAR Program³⁹

Through its Natural Gas STAR Program, EPA works with oil and natural gas companies to promote proven, cost-effective technologies and practices that improve operational efficiency and reduce CH₄ (i.e., natural gas) emissions. CH₄ is emitted by oil production and all sectors of the natural gas industry, from drilling and production, through processing and storage, to T&D. Since its launch in 1993, Natural Gas STAR has been successful in working with U.S. oil and natural gas companies to reduce more than one trillion cubic feet of CH₄ emissions and bring more energy to markets.

2.4.4 Coalbed Methane Outreach Program⁴⁰

EPA's voluntary Coalbed Methane Outreach Program (CMOP) has the goal of reducing CH₄ emissions from coal mining activities. CMOP's mission is to promote the profitable recovery and utilization of coal mine methane (CMM), a valuable fuel source. Since 1994, CMOP has worked cooperatively with the coal mining industry to reduce CMM emissions from underground, surface, and abandoned mines. The benefits of capturing and using CMM include improved worker safety, lower GHG emissions, an additional revenue stream for the mine, and a source of local clean energy. In recent years, new projects, such as ventilation air methane oxidation and electricity generation from drained gas, have come on line.

³⁸ See <http://www.epa.gov/ozone/snap>.

³⁹ See <http://www.epa.gov/gasstar>.

⁴⁰ See <http://www.epa.gov/coalbed/>.

2.4.5 Fluorinated Greenhouse Gas Programs⁴¹

EPA's voluntary fluorinated greenhouse gas (FGHG) partnership programs continue to make significant reductions in potent GHG emissions by working with participating industries. Through these programs, EPA identifies cost-effective emission reductions opportunities, recognizes industry accomplishments, and facilitates the transition toward environmentally friendlier technologies and best environmental practices. Partners include aluminum producers, electrical T&D system operators, supermarkets, utilities, and appliance retailers and manufacturers.

Although FGHGs account for a small portion of total U.S. GHG emissions, they have very high GWPs, and emissions on a per-facility basis tend to be high. PFCs and sulfur hexafluoride (SF₆) also have extremely long atmospheric lifetimes, making climate impacts essentially irreversible.

2.4.5.1 Voluntary Aluminum Industry Partnership

EPA's Voluntary Aluminum Industry Partnership works with industry to reduce PFCs, tetrafluoromethane, and hexafluoroethane where cost-effective technologies and operational practices are technically feasible. The partnership works to reduce PFC emissions through training and implementing best practices in pot rooms. In addition, the partnership has advanced the scientific understanding of PFC emissions from primary aluminum production. Work has included evaluating smelter cell conditions at the initiation of PFC-emitting anode effects and documenting low-voltage PFC emissions in different technology types.

2.4.5.2 SF₆ Emission Reduction Partnership for Electric Power Systems

Through its SF₆ Emission Reduction Partnership for Electric Power Systems, EPA works with electric power T&D companies to reduce emissions of SF₆, which is used as a gaseous dielectric in high-voltage circuit breakers and gas-insulated substations. The program promotes best management practices and cost-effective operational improvements, such as leak detection and repair, use of recycling equipment, and employee education and training. The program also engages stakeholders, such as equipment manufacturers, gas distributors, and recyclers, to improve SF₆ handling during installation, servicing, and decommissioning of equipment.

2.4.5.3 GreenChill Advanced Refrigeration Partnership

Through the GreenChill Advanced Refrigeration Partnership, EPA works with supermarkets to reduce the amount of refrigerants they use in their stores and emit to the atmosphere. Refrigerants are high-GWP and often ozone-depleting gases, so their minimization is especially beneficial for the environment. GreenChill now has 50 partners with more than 8,000 supermarkets (more than 21 percent of all U.S. supermarkets) in all 50 states.

⁴¹ See <http://www.epa.gov/climatechange/EPAactivities/voluntaryprograms.html>; <http://www.epa.gov/climatechange/EPAactivities/voluntaryprograms.html>; <http://www.epa.gov/greenchill>; <http://www.epa.gov/rad>; and <http://www.epa.gov/ozone/snap/fire/vcopdocument.pdf>.

On average, more than 20 percent of the refrigerant used each year in the supermarket industry is released into the atmosphere in the form of harmful GHGs. Since the start of the program in 2007, GreenChill partners have reduced their aggregate total corporate emission rate to below 12 percent per year—about half the national average.

2.4.5.4 Responsible Appliance Disposal Program

Through EPA’s voluntary Responsible Appliance Disposal Program partners—utilities, retailers, manufacturers, and state affiliates—ensure responsible disposal of refrigerant-containing appliances in order to recover and recycle refrigerants and recycle or properly destroy GHGs from foam, thereby reducing emissions of high-GWP gases. The partners also prevent the release of hazardous materials (e.g., used oil, polychlorinated biphenyls, and mercury), and save landfill space and energy by recycling durable materials.

2.4.5.5 Voluntary Code of Practice

EPA also works with manufacturers and distributors in the U.S. fire protection industry to advance the Voluntary Code of Practice for the Reduction of Emissions of HFC & PFC Fire Protection Agents (VCOP), which minimizes nonfire emissions of HFCs and PFCs (predominantly HFCs), while effectively protecting people and property from the threat of fire. Approximately 14 manufacturers and distributors annually report to the HFC Emissions Estimating Program, tracking industry-wide emissions of HFCs and progress under VCOP.

2.5 Agricultural Sector

The federal government is utilizing voluntary, economic, and informational instruments to reduce GHG emissions from the agricultural sector. USDA and EPA implement policies and measures to reduce CO₂, CH₄, and NO_x emissions from this sector. See Table 4-2 for estimates of GHG emissions reductions in the agricultural sector.

2.5.1 Conservation Reserve Program⁴²

The Conservation Reserve Program (CRP) pays farmers to voluntarily convert environmentally sensitive acreage to native grasses, wildlife plantings, trees, restored wetlands, filter strips, or riparian buffers under 10–15 year contracts. Administered by USDA’s Farm Service Agency (FSA), the CRP sequesters more carbon on private lands than any other federally administered program. FSA also facilitates the potential for private sale of carbon credits for lands enrolled in the CRP, as USDA does not claim ownership to related credits. FSA includes carbon sequestration potential in its ranking process, by which offers are selected for enrollment. In addition to increasing carbon sequestration, CRP lands produce GHG benefits in the form of reduced CO₂ emissions from fewer field operations and reduced NO_x emissions from avoided fertilizer applications.

2.5.2 Natural Resources Conservation Service Programs⁴³

⁴² See <http://fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp>.

⁴³ See www.nrcs.usda.gov/.

USDA's Natural Resources Conservation Service (NRCS) administers several conservation programs designed to address specific natural resource concerns on working agricultural lands—i.e., lands in active crop, livestock, or forestry production. The concerns include reducing soil erosion, enhancing water supplies, improving water quality, increasing wildlife habitat, and reducing damages caused by floods and other natural disasters. In each program, participation by producers and other land owners is voluntary.

Typically, participants enter into fixed-term contracts with USDA, in which they receive financial and technical assistance in exchange for agreeing to implement specified conservation practices or measures within their operation. Contracts identify the resource concern(s) to be addressed and require producers to develop a plan of operations that identifies the conservation practices or measures needed to address identified natural resource concerns. GHG mitigation is a resource concern identified under NRCS conservation programs, and many of the practices and measures encouraged in the programs reduce GHG emissions and/or increase carbon sequestration.

In terms of addressing GHG emissions and encouraging carbon sequestration, the principal NRCS conservation programs are the Environmental Quality Incentives Program (EQIP) and Conservation Technical Assistance (CTA) Program. EQIP provides financial and technical assistance to eligible producers based on a portion of the average cost associated with practice implementation. Additional payments may be available to help producers develop conservation plans, which are required to obtain financial assistance. Program contracts can cover periods of up to 10 years, and total program payments to any participant are generally capped at \$300,000 during any 6-year period. NRCS has identified 23 EQIP conservation practices that result in quantifiable carbon sequestration or emission reductions. Between 2010 and 2012, annual GHG mitigation benefits associated with these practices ranged between 3.2 and 4.0 Tg CO₂e.

The CTA Program provides technical assistance to landowners and other individuals and groups responsible for managing nonfederal lands. The program addresses opportunities, concerns, and problems related to the use of natural resources and helps land users make sound natural resource management decisions on private, tribal, and other nonfederal lands. Many of the changes in land management that have been facilitated through the CTA Program reduce GHG emissions and/or increase carbon sequestration. Between 2010 and 2012, the annual GHG mitigation benefits of the program ranged between 7.9 and 8.4 Tg CO₂e.

Other NRCS conservation programs include the Conservation Stewardship Program, Wildlife Habitat Incentive Program, Wetlands Reserve Program, Farm and Ranchland Protection Program, and Grassland Reserve Program. These programs target more specific conservation objectives than EQIP and the CTA Program, but similarly contribute to addressing GHG resource concerns. Between 2010 and 2012, the estimated aggregate annual GHG mitigation for the above programs ranged between 0.38 and 0.75 Tg CO₂e.

2.5.3 AgSTAR⁴⁴

⁴⁴ See www.epa.gov/agstar.

AgSTAR was launched as a voluntary effort between EPA and USDA in 1993. Run by EPA with support from USDA, AgSTAR encourages the use of methane (biogas) recovery technologies at confined animal feeding operations that manage manure as liquids or slurries. These technologies reduce methane emissions while achieving other environmental benefits. The practices recommended under AgSTAR have been incorporated into USDA's broader technical, conservation, and cost-share programs. AgSTAR also works at a national level to identify and address barriers to these biogas recovery projects, as well as to provide information and training to state and local government agencies that permit these projects and the private-sector organizations that implement them. Key benefits promoted by AgSTAR includes sustainable management of manure, reduced GHG emissions, and the development of value-added byproducts.

2.6 Forestry Sector

USDA's Forest Service (USFS) continues to implement federal programs for climate mitigation, utilizing voluntary, economic, and informational instruments.

2.6.1 Woody Biomass Utilization Grant Program⁴⁵

The Woody Biomass Utilization Grant Program focuses on creating markets for small-diameter woody material and low-valued trees removed during forest restoration activities. Grants range from \$50,000 to \$250,000, can be in place for up to three years, and require a nonfederal match of at least 20 percent. Grantees report on the amount of green tons of woody biomass that is removed and utilized each year. Since most of this biomass would have otherwise been piled and burned in the open, GHG mitigation benefits accrue in the form of reduced CO₂ emissions associated with open residue burning.

In 2011 and 2012, the program's focus shifted to assisting wood energy facilities to develop the engineering design and detailed cost estimates critical to obtaining and leveraging funding. These facilities are not yet operational, so biomass removals and GHG benefits are not reported for these years in Table 4-2.

2.6.2 Forest Ecosystem Restoration and Hazardous Fuels Reduction Programs⁴⁶

Since 2000, several USFS policies and initiatives (e.g., the National Fire Plan, Healthy Forests Initiative, Healthy Forests Restoration Act, National Cohesive Wildland Fire Management Strategy, and the Collaborative Forest Landscape Restoration Program) have aimed to reduce wildfire risk near communities and elsewhere, to restore or increase forest resilience to climate-related stressors, such as drought, wildfire, insects, and disease. These programs and initiatives have applied restoration treatments to 10.6 million hectares (27.6 acres). The net CO₂ mitigation impacts of these programs and initiatives are difficult to quantify because they largely take the form of an enhanced ability of treated areas to sequester carbon over the long term.

⁴⁵ See http://www.fpl.fs.fed.us/research/units/tmu/tmugrants_goals.shtml.

⁴⁶ For forest ecosystem restoration, see <http://www.fs.fed.us/restoration/>; for hazardous fuels, see <http://fsweb.wo.fs.fed.us/fire/fam/fuels/hazardous.html>; for restoring and maintaining landscapes, see <http://www.forestsandangelands.gov/strategy/goals.shtml>.

2.7 Waste Management/Waste Sector

Federal policies and measures to reduce greenhouse gases from the waste management/waste sector are being implemented by EPA. Regulatory and voluntary efforts are reducing methane emissions from landfills, while carbon dioxide emissions reductions result from sustainable materials management programs. See Table 4-2 for estimates of GHG emissions reductions.

2.7.1 Landfill Air Regulations⁴⁷

Municipal solid waste landfills are the third largest source of U.S. anthropogenic CH₄ emissions. Promulgated in 1996, the New Source Performance Standards and Emission Guidelines require large landfills to collect and control their gas emissions. Landfill gas is comprised of approximately 50 percent CH₄, 50 percent CO₂, and trace amounts of nonmethane organic compounds. Although the emission thresholds in both rules are based on nonmethane organic compounds, significant CH₄ co-benefits are also achieved. EPA estimates that the 1996 rules will reduce emissions by about 183 Tg CO₂e in 2020.

2.7.2 Landfill Methane Outreach Program⁴⁸

EPA's Landfill Methane Outreach Program (LMOP) reduces GHG emissions at landfills by supporting the recovery and use of landfill gas for energy. Capturing and using landfill gas reduces CH₄ emissions directly and reduces CO₂ emissions indirectly by displacing the use of fossil fuels through the utilization of landfill gas as a source of energy. LMOP focuses its efforts on smaller landfills that are not required to collect and combust their landfill gas, as well as larger regulated operations that are combusting their gas but not utilizing it as a clean energy source. LMOP has developed a range of technical resources and tools to help the landfill gas industry overcome barriers to energy development, including feasibility analyses, project evaluation software, a database of approximately 500 candidate landfills across the country, a project development handbook, and industrial sector analyses.

2.7.3 Sustainable Materials Management Programs⁴⁹

Historically, most of the nation's resource conservation efforts have focused on decisions to reuse or recycle materials that would otherwise be disposed of as waste. Although these remain important resource conservation practices, they only represent a fraction of all the opportunities available to conserve resources.

Through a sustainable materials management (SMM) approach, EPA is helping change the way Americans protect the environment and conserve resources for future generations. SMM is a systemic approach that seeks to reduce materials use and their associated environmental impacts over their entire life cycle, starting with

⁴⁷ See <http://www.epa.gov/ttn/atw/landfill/landflpg.html>.

⁴⁸ See www.epa.gov/lmop.

⁴⁹ See <http://www.epa.gov/smm>; and <http://www.epa.gov/wastewise>.

extraction of natural resources and product design and ending with decisions on recycling or final disposal. EPA is playing a leadership role in advancing SMM by convening dialogues with key SMM stakeholders, providing sound science and information to the public, and establishing challenges to specific sectors to achieve shared goals. EPA is collaborating with other federal agencies, businesses, and schools in key SMM challenges, including Federal Green Challenge, Food Recovery Challenge, and Electronics Challenge.

EPA is also working with organizations and businesses to reduce municipal and select industrial wastes via the WasteWise program. Launched in 1994, WasteWise has become a mainstay in environmental stewardship and continues to evolve to address tomorrow's environmental needs.

2.8 Federal Government Leading by Example

Since the federal government is the largest single user of energy in the United States, a great potential for GHG emission reductions exists from federal facilities themselves. Implementation of efforts to reduce CO₂ emissions from federal facilities continues since the 2010 CAR, with great progress being made. See Table 4-2 for estimates of GHG emission reductions.

2.8.1 E.O. 13514: Federal Leadership in Environmental, Energy, and Economic Performance⁵⁰

In October 2009, President Obama signed Executive Order (E.O.) 13514, setting sustainability goals for federal agencies and focusing on improving each agency's environmental, energy, and economic performance. E.O. 13514 required federal agencies to establish a 2020 GHG emission reduction target, increase energy efficiency and renewable energy use, reduce fleet petroleum consumption, conserve water, reduce waste, support sustainable communities, and leverage federal purchasing power to promote sustainable products and technologies.

E.O. 13514 requires federal agencies to meet a number of energy, water, and waste reduction targets, relative to 2005, including:

- 30 percent reduction in vehicle fleet petroleum use by 2020;
- 26 percent improvement in water efficiency by 2020;
- 50 percent recycling and waste diversion by 2015;
- 95 percent of all applicable contracts in compliance with sustainability requirements;
- Implementation of the 2030 net-zero-energy building requirement;
- Implementation of the stormwater provisions of Section 438 of EISA; and
- Development of guidance for sustainable federal building locations in alignment with the Livability Principles put forward by the U.S. Department of Housing and Urban Development (HUD), DOT, and EPA.

In 2010, President Obama announced a federal government-wide target of a 28 percent reduction by 2020 in direct GHG emissions, such as those from fuels and building energy use, and a target 13 percent reduction by

⁵⁰ See <http://sustainability.performance.gov/>.

2020 in indirect GHG emissions, such as those from employee commuting and landfill waste. Implementation of E.O. 13514 has focused on integrating the pursuit of sustainability goals with agency missions and strategic planning, to optimize performance and minimize implementation costs. Under E.O. 13514, federal agencies are required to develop, implement, and annually update a plan that prioritizes actions based on a positive return on investment for the American taxpayer and to meet GHG emission, energy, water, and waste reduction targets.

On February 7, 2013, the federal agencies released their third annual Sustainability Plans.⁵¹ In these updated plans, agencies discuss highlights and challenges from the previous year and explain how they will refine their strategies, expand on successes, and plan new initiatives to meet the goals of E.O. 13514 (Box 4-4).

Implementation by agencies is managed through the previously established Office of the Federal Environmental Executive, working in close partnership with the Office of Management and Budget, the White House Council on Environmental Quality, and the federal agencies.

Box 4-4: E.O. 13514

The main path by which the U.S. Department of Defense (DoD) intends to achieve its goal for GHG emission reductions under E.O. 13514 is through reduced consumption of fossil fuels by facilities and vehicles, and an increased use of renewable energy. The DoD target of 34 percent reduction from FY 2008 levels by 2020 includes cumulative Scope 1 and 2 GHG emissions.⁵² In FY 2012, DoD reduced annual GHG emissions by 1.29 million metric tons of CO₂e, a 9.2 percent reduction from 2008 levels.

DoD continues to pursue an investment strategy designed to reduce energy demand in fixed installations managed by its military departments, while increasing the supply of renewable energy sources. Efforts to curb demand for energy—through conservation and improved energy efficiency—are by far the most cost-effective ways to improve an installation's energy profile. A large fraction of DoD energy efficiency investments goes to retrofit existing buildings. Typical retrofit projects install high-efficiency heating, ventilation, and cooling systems; energy management control systems; more efficient lighting; and green roofs.

2.8.2 Federal Energy Management Program⁵³

DOE's Federal Energy Management Program (FEMP) works with federal leaders to accomplish energy change within organizations by bringing expertise from all levels of project and policy implementation to enable federal agencies to meet energy-related goals and to provide energy leadership to the nation. FEMP assists agencies in identifying, obtaining, and implementing project funding mechanisms, guiding them to use funding more effectively to meet federal and agency-specific energy management objectives. FEMP provides technical support in sustainable design, energy efficiency, renewable energy, water conservation, fleet management, product procurement, technology deployment, and laboratory and data center best practices. FEMP also helps

⁵¹ Ibid.

⁵² Scope 1 includes all direct GHG emissions; Scope 2 includes indirect GHG emissions from consumption of purchased electricity, heat, or steam; and Scope 3 includes all other indirect emissions.

⁵³ See <http://www1.eere.energy.gov/femp/index.html>.

federal agencies comply with applicable energy, water, and fleet requirements by advising on energy management authorities, developing rules and guidance, evaluating reported data, tracking agency progress, providing training, developing interagency collaboration, and motivating federal staff through awards and incentives.

2.8.3 National Park Service Programs⁵⁴

The National Park Service (NPS) is committed to reducing its impact on the environment, mitigating the effects of climate change, and integrating sustainable practices within and across its borders. The NPS Director's *Call to Action* lays out how the NPS will prepare for our second century of stewardship and engagement and calls on NPS staff to "Go Green" by reducing GHG emissions (U.S. DOI/NPS 2011).

In 2012, the NPS released the *Green Parks Plan* (GPP) to define a collective vision and long-term strategic plan for sustainable management of NPS operations (U.S. DOI/NPS 2012). Within the first year of the GPP's release, the NPS has made significant progress toward meeting many of the plan's goals, including reducing emissions, energy and water use and intensity, and waste production. Through the GPP's implementation, the NPS has succeeded in:

- Decreasing Scope 1 and 2 GHG emissions by 13 percent and Scope 3 GHG emissions by 7 percent.⁵⁵
- Reducing NPS-wide building energy intensity by 18 percent.
- Decreasing potable water use by 22 percent.
- Increasing waste diversion by 28 percent.

To support GPP goals, the Climate Friendly Parks (CFP) Program continues to engage NPS staff in the climate change and sustainability conversation. With more than 100 member parks, CFP assists parks in measuring GHG emissions; provides educational opportunities for staff and the public to learn about climate change and sustainability-related topics; and aids in the development of park-based strategies and specific actions to reduce GHG emissions, address sustainability challenges, and anticipate the effects of climate change on park resources.

Also in support of the GPP and Go Green challenge, the NPS and DOE partnership, Clean Cities National Parks Initiative, takes the NPS yet another step further in reducing GHG emissions associated with transportation in and around national parks. This unique partnership supports transportation projects that help to educate park visitors on the benefits of reducing dependence on petroleum, cutting GHG emissions, and easing traffic congestion. Participant parks and projects include Mammoth Cave National Park's propane-powered school buses and pickup trucks, and electric utility vehicles; San Antonio Mission National Historical Park's propane-powered mowers and pickup trucks, and installation of two 220-volt electric vehicle chargers with data collection capabilities; and Yellowstone National Park's electric utility and hybrid vehicles, and implementation of a no-idling campaign for visitors and employees.

⁵⁴ See <http://www.nps.gov/calltoaction/>; <http://www.nps.gov/greenparksplan/>; <http://www.nps.gov/climatefriendlyparks/>; and http://www1.eere.energy.gov/cleancities/national_parks.html.

⁵⁵ Scope 1 includes all direct GHG emissions; Scope 2 includes indirect GHG emissions from consumption of purchased electricity, heat, or steam; and Scope 3 includes all other indirect emissions.

2.9 Cross-cutting

Several federal policies and measures seek to mitigate climate change across multiple sectors. Multiple federal agencies implement cross-cutting programs, utilizing regulatory, economic, and informational instruments. See Table 4-2 for estimates of GHG cross-cutting emission reductions.

2.9.1 Best Available Control Technology for GHG Emissions⁵⁶

The CAA requires large stationary sources of air pollution to apply for and receive permits before building a new facility or modifying an existing facility. These permits include information on the amount of GHGs a facility can emit, how often a facility can be run, and any other requirements that would ensure public health and the environment continues to be protected after the facility begins to operate. A key component of these permits is the requirement for large sources of emissions to use the best available technology for controlling GHG emissions. EPA anticipates that, in most cases, this requirement will be met through energy efficiency improvements.

In May 2010, EPA issued a regulation establishing a common-sense approach to permitting GHG emissions. EPA continues to focus GHG permitting on the largest emitters and has worked with states and industry to make a number of important updates that streamline the permitting process. As of April 2013, EPA and states have issued nearly 90 permits to large industrial sources that cover GHG emissions. In addition, EPA is processing or tracking more than 75 permit applications from across the United States that have not yet been issued.

2.9.2 Mandatory Greenhouse Gas Reporting Rule⁵⁷

In 2009, EPA issued the Greenhouse Gas Reporting Rule. The rule requires reporting of GHG emissions from 41 U.S. industry groups that, in general, emit 25,000 metric tons (MTs) or more of CO₂e per year. The 25,000-MT reporting threshold is roughly equivalent to the annual GHG emissions from just over 5,200 passenger vehicles or the carbon equivalent of burning 107 rails cars of coal.⁵⁸

The GHG Reporting Program is intended to collect accurate and timely emissions data to inform future policy decisions. Under the rule, direct emitters and suppliers of certain products that would result in GHG emissions if released, combusted, or oxidized or facilities that inject CO₂ underground (e.g., for geologic sequestration) are required to submit electronic annual reports to EPA. The gases covered by the GHG Reporting Rule are CO₂, CH₄, nitrous oxide (N₂O), HFCs, PFCs, SF₆, and other fluorinated gases, including nitrogen trifluoride, and hydrofluorinated ethers. The reporting program covers about 85-90 percent of total U.S. emissions from approximately 8,000 facilities. Annual reporting began in 2011 for calendar year 2010 emissions. EPA now has

⁵⁶ See <http://www.epa.gov/nsr/ghgpermitting.html>.

⁵⁷ See www.epa.gov/ghgreporting/index.html.

⁵⁸ See <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>.

three years of data for 29 industry groups and two years of data for an additional 12 industry categories. Publicly available GHG data is published in EPA's user-friendly FLIGHT (Facility Level Information on Greenhouse gases Tool) and in Envirofacts.⁵⁹

2.9.3 State Energy Program⁶⁰

Through its State Energy Program, DOE provides financial and technical assistance to states through formula and competitive grants. States use their formula grants to develop state strategies and goals to address their energy priorities. Competitive grant solicitations for the adoption of energy efficiency/renewable energy products and technologies are issued annually based on available funding.

Indian Energy Programs provide financial and technical assistance that enables American Indian and Alaska Native tribes to deploy renewable energy resources, reduce their energy costs through efficiency and weatherization, and increase energy security for tribes and villages.

2.9.4 Energy Efficiency and Conservation Block Grants⁶¹

DOE's Energy Efficiency and Conservation Block Grant Program provided more than \$2.7 billion in funding to local and state governments, tribal governments, and territories. The program assists eligible entities in implementing strategies that will improve energy efficiency in the transportation, building, and other appropriate sectors, and reduce fossil fuel emissions and total energy use in an environmentally sustainable manner. Activities that may use grant funds range from strategic planning, information sharing, and developing building codes, to installing renewable energy technologies, to implementing technologies to reduce, capture, and use GHGs from landfills or similar sources.

In addition, the Community Renewable Energy Deployment grant program leveraged \$20.5 million in ARRA funding, with approximately \$167 million in local government and private industry funding to complete five projects nationwide. The projects receive technical assistance from DOE's National Renewable Energy Laboratory in the areas of concepts, best practices, planning, financial approaches, and policy guidance.

2.9.5 Weatherization Assistance Program⁶²

DOE's Weatherization Assistance Program (WAP) enables low-income families to permanently reduce their energy bills by making their homes more energy efficient. Funds are used to improve the energy performance of dwellings of needy families, using the most advanced technologies and testing protocols available in the housing industry. WAP provides funding, primarily through formula grants, to states, U.S. overseas territories, and Indian tribal governments, which manage the day-to-day details of the program. These governments, in turn, fund a network of community action agencies, nonprofit organizations, and local governments that provide

⁵⁹ See <http://ghgdata.epa.gov/ghgp/main.do> and <http://www.epa.gov/enviro/>.

⁶⁰ See <http://www1.eere.energy.gov/wip/sep.html>; and <http://www.eere.energy.gov/tribalenergy>.

⁶¹ See <http://www1.eere.energy.gov/wip/eeecbg.html>.

⁶² See <http://www.eere.energy.gov/weatherization/>.

these weatherization services in every state, the District of Columbia, U.S. territories, and among Native American tribes.

The energy conservation resulting from these efforts of state and local agencies helps the United States reduce its dependence on foreign oil and decrease the cost of energy for families in need, while improving the health and safety of their homes. Because the energy improvements that make up weatherization services are long lived, the savings add up over time to substantial benefits for weatherization clients and their communities, and the nation as a whole.

2.9.6 Loan Guarantee Programs⁶³

DOE's Loan Guarantee Programs enable DOE to work with private companies and lenders to mitigate the financing risks associated with innovative and advanced energy technologies, thereby fostering their deployment on a broader, commercial scale. DOE's LPO provides loan guarantees to qualifying projects that employ new or significantly improved energy technologies that avoid, reduce, or sequester air pollutants or GHGs. As of FY 2013, the EPCA Section 1703 Loan Program has \$1.5 billion in authority and \$170 million in appropriated credit subsidy for energy efficiency and renewable energy projects. Through the now closed EPCA Section 1705 Loan Program, an additional \$2 billion in credit subsidy was provided in ARRA to support up to \$16 billion in loans for renewable energy and transmission projects, including commercial and advanced technologies. There are 26 active loan guarantees.

2.9.7 Tax Provisions⁶⁴

Several existing federal energy tax provisions and energy grants may reduce GHGs. Combined, these provisions have estimated federal tax expenditures for FY 2012 of more than \$10 billion. This includes estimated payments from the U.S. Department of the Treasury authorized by ARRA Section 1603. Tax expenditures are exceptions to baseline provisions of the tax structure that usually result in a reduction in the amount of tax owed. Federal energy tax provisions capture various objectives that help reduce GHG emissions across transportation, energy, and industrial sectors:

- Providing an incentive for alternative fuel vehicles through the credit and deduction for clean fuel-burning vehicles.
- Providing an incentive for renewable and alternative energy production—either as an incentive directly for production, or indirectly through property and manufacturing projects that help support production. Incentives include the Residential Energy Efficient Property Credit, the Energy Production Tax Credit (for renewable and alternative energy only), the Business Energy Investment Tax Credit, the Energy Grant (in lieu of the Business Energy Investment Tax Credit and the Energy Production Tax Credit), the credit for holding Clean Renewable Energy Bonds and Qualified Energy Conservation Bonds (which also encourages energy conservation), and the Qualifying Advanced Energy Property Credit.
- Encouraging energy conservation through the Deduction for Energy Efficient Commercial Buildings, Credit for Construction of New Energy Efficient Homes, Credit for Energy Efficient Improvements to

⁶³ See <http://www.lgprogram.energy.gov/>.

⁶⁴ See <http://www.whitehouse.gov/sites/default/files/omb/budget/fy2014/assets/receipts.pdf>.

Existing Homes, the Manufacturers' Energy Efficient Appliance Credit, and Exclusion of Utility Conservation Subsidies.

- Encouraging carbon sequestration through the Industrial CO₂ Capture and Sequestration Tax Credit.

2.9.8 Interagency Partnership for Sustainable Communities⁶⁵

Through the interagency Partnership for Sustainable Communities, DOT, HUD, and EPA are aligning federal policies and investments for transportation, environmental protection, and housing. Partnership agencies support communities that want to give Americans more choices in housing and transportation, and build healthy and economically vibrant neighborhoods. Through these efforts, the Partnership is helping communities make it convenient for residents to walk, bike, take transit, or drive short distances to daily destinations.

Between 2009 and 2012, the Partnership provided more than \$3.5 billion in assistance to more than 700 communities, and funded 744 projects with approximately \$3.51 billion. Partnership grant and technical assistance recipients are located in all 50 states, the District of Columbia, and Puerto Rico.

Partnership agency efforts include the following:

- Between 2009 and 2012, HUD awarded 152 grants in 48 states as part of its Sustainable Communities Initiative. The \$240 million in federal investment leveraged almost \$253 million in private investment and commitments from local partners.
- In 2012, Partnership agencies announced support for the Governors' Institute on Community Design to provide enhanced technical guidance to governors seeking to tackle housing, transportation, environmental, and health challenges. Facilitated by EPA, the Institute brings together leading practitioners and academics in government, design, development, and regional economics to help governors make informed choices about growth and development.
- Since 2009, DOT has awarded \$3.1 billion in TIGER Discretionary Grants to 218 projects in all 50 states, the District of Columbia, and Puerto Rico. The program's competitive review process allows DOT to choose projects that will improve energy efficiency and make significant investments in expanding transportation choices for communities across the nation.

Key benefits of this partnership include reduced vehicle miles traveled (VMTs), lower per-capita GHG emissions, and reduced dependence on fossil fuels.

2.9.9 Center for Corporate Climate Leadership⁶⁶

EPA's Center for Corporate Climate Leadership was launched in 2012 to establish norms of climate leadership by encouraging organizations with emerging climate objectives to identify and achieve cost-effective GHG emission reductions, while helping more advanced organizations reduce their GHG impacts outside of their operations (e.g., in their supply chains). The Center serves as a comprehensive resource to help organizations measure and manage GHG emissions, providing technical tools, ground-tested guidance, educational resources, and opportunities for information sharing and peer exchange among organizations. The Center also recognizes exemplary corporate, organizational, and individual leadership in addressing climate change by co-sponsoring the Climate Leadership Awards.

⁶⁵ See <http://www.sustainablecommunities.gov/index.html>.

⁶⁶ See www.epa.gov/climateleadership.

2.10 Measuring Progress

The U.S. government is continuing to make important progress toward reducing GHG emissions through policies and measures that promote increased investment technologies and practices that reduce CO₂, methane, and other GHG emissions across all sectors. Table 4-2 summarizes the U.S. policies and measures discussed above, and provides their estimated annual GHG mitigation impacts in 2011 and expected annual reductions in 2015 and 2020. The estimates are not cumulative reductions; rather, they are a snapshot of estimated annual reductions.

Mitigation levels and projections are estimated using a range of methodologies and assumptions, as appropriate, given sector affected, type of effort, and statutory requirements. Levels and projections are subject to change in the future and may have changed relative to those presented in past reports due to improvements in calculation methodologies. GHG mitigation estimates are offered to demonstrate progress made by individual policies and measures, should not be aggregated to the sectoral level, and may not be directly comparable, due to differences in calculation methodology and possible synergies and interactions among policies and measures that may result in double counting. Additional details on these policies and mitigation estimates can also be found in Appendix X.

The policies and measures in this chapter highlight the successful U.S. government initiatives focused on reducing GHG emissions. Although many of them include projections for reducing GHGs, several do not for a variety of reasons, such as potential for double counting, lack of quality data, lack of data specific to program actions, and varying stages of implementation and types of measures. For example, policies to encourage greater transparency and improved measurement of GHG emissions may not reduce emissions directly, but the existence of such policies is key to enabling additional actions to reduce GHG emissions. Further, the projections presented in this chapter should not be compared to the information presented in Chapter 5, which is inclusive of actions from the full suite of U.S. policies and measures, and avoids double counting.

Table 4-2: Summary of Federal Policies and Measures by Sector

The U.S. Government deploys a robust set of policies and measures to reduce GHGs across sectors.

Name of Policy or Measure	Objective and/or Activity Affected	GHGs Affected	Types of Instrument	Status	Implementing Entities	Estimated Mitigation Impacts (Tg CO ₂ e)		
						2011	2015	2020
Transportation								
Light Vehicle CAFE Standards and GHG Standards	Establishes corporate average fuel economy and GHG emission standards for new light-duty vehicles (LDVs) produced for sale in the U.S.	CO ₂ , HFCs	Regulatory	Implemented	DOT and EPA	35	92	236
Renewable Fuel Standard	Increases the share of renewable fuels used in transportation via implementation of the Renewable Fuel Standard program.	CO ₂	Regulatory	Implemented	EPA	n/a	n/a	138
Fuel Efficiency and GHG Emission Program for Medium- and Heavy-Duty Vehicles	Establishes fuel efficiency and GHG emission standards for work trucks, buses, and other heavy-duty vehicles.	CO ₂ , N ₂ O, CH ₄ , HFCs	Regulatory	Implemented	DOT/EPA	n/a	n/a	37.7
SmartWay Transport Partnership	Promotes collaboration with businesses and other stakeholders to decrease climate-related and other emissions from goods movement.	CO ₂	Voluntary	Implemented	EPA	23.6	37	43
Light Duty Vehicle Fuel Economy and Environment Label	Provides comparable information on new vehicles' fuel economy, energy use, fuel costs, and environmental impacts.	CO ₂	Regulatory, Information	Implemented	EPA/DOT/DOE	n/a	n/a	n/a
Diesel Emissions Reduction Program (DERA)	Reduces diesel emissions through the implementation of proven emission control technologies and innovative strategies.	CO ₂	Voluntary/ Negotiated Agreements	Implemented	EPA	n/a	n/a	n/a
Advanced Technology Vehicle Manufacturing Loan Program	Provides direct loans to qualifying U.S. advanced technology vehicles or component and engineering integration projects.	CO ₂	Economic	Implemented	DOE	1.5	2.5	2.5
State and Alternative Fuel Provider Fleet Program	Requires covered fleets either to acquire alternative fuel vehicles as a percentage of their annual LDV acquisitions or to employ other petroleum-reduction methods.	CO ₂	Regulatory	Implemented	DOE	n/a	n/a	n/a
Next Generation Air Transportation System	Achieves more efficient aircraft operations and reduced GHG emissions through airspace, operational, and infrastructure improvements. The Continuous Lower Energy, Emissions, and Noise Program is an element of NextGen	CO ₂	Economic, Research	Implemented	DOT	n/a	n/a	0.016
Additional Aviation Low	Implement strategies that reduce GHG emissions	CO ₂	Economic,	Implemented	DOT	n/a	n/a	n/a

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Emissions, Fuel Efficiency, and Renewable Fuels Measures	from the aviation sector. Programs include Aviation Climate Change Research Initiative; Commercial Aviation Alternative Fuel Initiative; and Voluntary Airport Low Emissions Program.		Voluntary, Research					
Federal Transit and Railway Programs	Help public transportation providers, railways, and other key stakeholders to implement strategies that reduce GHGs.	All	Fiscal, Voluntary, Research	Implemented	DOT	n/a	n/a	n/a
On-road GHG Assessment Tools	Supports and encourages state and local governments to estimate future GHG emissions from the on-road portion of the transportation sector and find strategies to mitigate these effects.	CO ₂	Information	Implemented	DOT	n/a	n/a	n/a
Energy: Supply								
Clean Energy Supply Programs	Green Power Partnership encourages U.S. organizations to voluntarily purchase green power, and CHP Partnership reduces the environmental impact of power generation by encouraging the use of combined heat and power.	CO ₂	Voluntary/ Negotiated Agreements	Implemented	EPA	29.6	44	73.3
Onshore Renewable Energy Development Programs	Provide opportunities for and encourage use of federal public lands for the development of non-emitting energy. Programs include the Solar Energy, Geothermal and Wind Development Programs.	CO ₂	Economic, Voluntary	Implemented	DOI/BLM	6.73	25.63	41.50
Rural Energy for America Program	Provides grants and loan guarantees to various rural residents, agricultural producers, and rural businesses for energy efficiency and renewable energy systems.	CO ₂	Voluntary, Economic	Implemented	USDA	1.9	10.21	17.52
CCS Demonstration and Large-Scale Geologic Storage Cooperative Agreements	The power plant, industrial, and geologic storage large-scale CCS demonstrations are cost-shared cooperative agreements between the government and industry to increase investment in CCS.	CO ₂	Economic	Implemented	DOE	1	7	16.2
Rural Development Biofuels Programs	Supports expansion of biofuels by providing payments to biorefineries and biofuel producers, and providing loan guarantees for biorefineries. Programs include the Bioenergy Program for Advanced Biofuels, Biorefinery Assistance Program, and Repowering Assistance Program.	CO ₂	Voluntary, Economic	Implemented	USDA	7.8	0.05	0.09
Biofuel Regional Feedstock Partnerships	Identify and analyze feedstock supply and regional logistics, and conduct crop field trials to address barriers to the development of a sustainable and predictable supply of biomass feedstocks.	CO ₂	Economic	Implemented	DOE	n/a	n/a	n/a
Smart Grid Investment Grants	Provide approximately \$9 billion toward the modernization of the electric grid in 131 Smart Grid Investment Grant projects around the country through public-private partnerships.	CO ₂	Economic	Implemented	DOE	n/a	n/a	n/a

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Offshore Renewable Energy Program—Bureau of Ocean Energy Management	Advances a sustainable Outer Continental Shelf renewable energy future through site planning and environmentally-responsible operations and energy generation.	CO ₂	Regulatory	Implemented	DOI	n/a	n/a	n/a
Price-Anderson and Nuclear Waste Policy Acts	Establish legal responsibility to manage nuclear waste and support the deployment of nuclear power by limiting nuclear plant operators' liability in the event of an accident.	CO ₂	Economic	Implemented	DOE	n/a	n/a	n/a
Energy: Residential, Commercial, and Industrial								
Appliance and Equipment Energy Efficiency Standards	Establish minimum energy conservation standards for more than 50 categories of appliances and equipment.	CO ₂	Regulatory	Implemented	DOE	156	195	216
ENERGY STAR-Labeled Products	Labels distinguish energy-efficient products in the marketplace.	CO ₂	Voluntary	Implemented	EPA/DOE	99.70	113.60	141.20
ENERGY STAR for the Commercial Market	Promotes improvement in energy performance in commercial buildings.	CO ₂	Voluntary	Implemented	EPA	86.60	75.00	93.50
Lighting Energy Efficiency Standards	Lighting component of DOE's comprehensive Appliance and Equipment Energy Efficiency Standards program.	CO ₂	Regulatory	Implemented	DOE	19	38	41
ENERGY STAR for Industry	Promotes improvement in energy performance across industry.	CO ₂	Voluntary	Implemented	EPA	32.20	25.60	36.60
ENERGY STAR-Certified New Homes	Promotes improvement in energy performance in residential buildings beyond the labeling of products.	CO ₂	Voluntary	Implemented	EPA	2.70	3.17	3.79
Home Performance with ENERGY STAR	Provides homeowners with resources to identify trusted contractors for high-quality, comprehensive energy audits and residential retrofits.	CO ₂	Economic	Implemented	DOE	0.20	0.80	2.80
Building Energy Codes	Develops cost-effective building energy codes with adoption and compliance strategies.	CO ₂	Regulatory	Implemented	DOE	n/a	n/a	n/a
Regional Clean Energy Application and Industrial Assessment Centers	Provide technical assistance, including energy audits to increase energy efficiency and reduce costs for CHP plants and industrial processes.	CO ₂	Economic	Implemented	DOE	n/a	n/a	n/a
Industry (Non-CO₂)								
Significant New Alternatives Policy Program	Facilitates smooth transition away from ozone-depleting chemicals in industrial and consumer sectors.	HFCs, PFC, SF ₆	Regulatory, Information	Implemented	EPA	206.9	252	311.1
Federal Air Standards for Oil and Natural Gas Sector	The new source performance standards control VOC emissions from various sources, substantially reducing methane emissions as a co-benefit.	CH ₄	Regulatory	Adopted	EPA	n/a	32.6	39.9
Natural Gas STAR Program	Works with oil and natural gas companies to promote proven, cost-effective technologies and	CH ₄	Voluntary, Information	Implemented	EPA	35.30	20.60	22.10

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	practices that improve operational efficiency and reduce methane (i.e., natural gas) emissions.							
Coalbed Methane Outreach Program	Voluntary program with the goal of reducing methane emissions from coal mining activities.	CH ₄	Voluntary, Information	Implemented	EPA	8.48	9.31	9.38
GreenChill Advanced Refrigeration Partnership	Reduces ozone-depleting and GHG refrigerant emissions from supermarkets.	HFCs	Voluntary/ negotiated agts; Information; Education	Implemented	EPA	3.80	5.44	8.75
Responsible Appliance Disposal Program	Reduces emissions of refrigerant and foam-blowing agents from end-of-life appliances.	HFCs	Voluntary/ negotiated agts	Implemented	EPA	0.31	0.36	0.62
SF6 Emission Reduction Partnership for Electric Power Systems	Partners with electric power transmission and distribution companies to reduce emissions of sulfur hexafluoride (SF6) which is used as a gaseous dielectric in high-voltage circuit breakers and gas-insulated substations.	SF6	Voluntary, Information	Implemented	EPA	6.40	8.98	9.28
Voluntary Aluminum Industry Partnership	Partners with industry to reduce PFCs, tetrafluoromethane, and hexafluoroethane where cost-effective technologies and operational practices are technically feasible.	PFCs	Voluntary, Information	Implemented	EPA	6.31	0.42	0.40
Voluntary Code of Practice for the Reduction of Emissions of HFC and PFC Fire Protection Agents	Minimizes non-fire emissions of HFCs and PFCs used as fire-suppression alternatives and protects people and property from the threat of fire through the use of proven, effective products and systems.	HFCs; PFCs	Voluntary/ negotiated agts	Implemented	EPA	n/a	n/a	n/a
Agriculture								
Conservation Reserve Program	Encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage.	CO ₂	Economic, Information	Implemented	USDA	51.6	41.5 - 61.2	41.5 - 61.2
Natural Resources Conservation Service	Helps landowners to implement practices or measures that address natural resource concerns.	CO ₂ , CH ₄ , N ₂ O	Voluntary, Economic, Information	Implemented	USDA	11.9	20.1	27.6
AgSTAR	Encourages the use of methane (biogas) recovery technologies at confined animal feeding operations that manage manure as liquids or slurries.	CH ₄	Voluntary, Information	Implemented	EPA, USDA	1.20	0.92	0.90
Forestry								
Woody Biomass Utilization Grants Program	Creates markets for small-diameter woody material and low-valued trees removed from forest restoration activities.	CO ₂	Voluntary, Economic, Information	Implemented	USDA	n/a	n/a	n/a
Forest Ecosystem Restoration and Hazardous Fuels Reduction Programs	Restore the health of the nation's forests, woodlands, and rangelands.	CO ₂	Voluntary	Implemented	USDA/ DOI/ DOE	n/a	n/a	n/a
Waste								

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Management/Waste								
Landfill Air Regulations	Limit GHG emissions by limiting methane emissions from landfills designed to hold at least 2.5 million megagrams of waste.	CH ₄	Regulatory	Implemented (under 8 year review)	EPA	n/a	162.7	183.1
Landfill Methane Outreach Program	Reduces GHG emissions at landfills by supporting the recovery and use of landfill gas for energy.	CH ₄	Voluntary, Information	Implemented	EPA	15.80	14.30	15.70
Sustainable Materials Management	Provides a systemic approach to reduce the use of materials and their associated environmental impacts over their entire life cycle.	CO ₂	Voluntary/ Negotiated Agreements, Information, Education	Implemented	EPA	n/a	0.01	0.03
Wastewise	Helps organizations and businesses apply sustainable material management practices to reduce municipal and select industrial wastes.	CO ₂	Voluntary/ Negotiated Agreements, Information, Education	Implemented	EPA	23.23	n/a	n/a
Federal Government								
Federal Energy Management Program	Promotes energy efficiency and renewable energy use in federal buildings, facilities, and operations.	CO ₂	Regulatory	Implemented	DOE	4.2	10.0	14.4
National Parks Service Programs	Support efforts to mitigate the effects of climate change and integrate sustainable practices. Programs include the Green Parks Program, Climate Friendly Parks, Clean Cities National Parks Initiative, Alternative Transport Systems and Use of Clean Vehicles, and Sarbanes Transit in the Parks Program.	CO ₂	Economic, Voluntary, Educational	Implemented	DOI	0.038	0.084	0.171
Cross-Cutting								
State Energy Program	Provides funding to state energy offices to reduce market barriers to the cost-effective adoption of renewable energy and energy efficiency technologies.	CO ₂	Economic	Implemented	DOE	8.57	14.88	16.19
Energy Efficiency and Conservation Block Grants	Assist eligible entities in implementing strategies that will improve energy efficiency in the transportation, building, and other sectors, and reduce fossil fuel emissions and total energy use.	CO ₂	Economic	Implemented	DOE	7.12	11.32	11.32
Sec. 1703/1705 Loan Guarantee Program	Mitigates the financing risks associated with innovative and advanced energy.	CO ₂	Economic	Implemented	DOE	0.35	7.25	7.25
Weatherization Assistance Program	Provides funding and technical support to states, U.S. territories, and tribes, which in turn work with a network of about 900 local agencies to provide trained crews to perform residential weatherization services for income-eligible households.	CO ₂	Economic	Implemented	DOE	1.87	2.87	3.30

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Indian Energy Policy and Programs/Tribal Energy Program	Provides financial and technical assistance that enables American Indian and Alaska Native tribes to deploy renewable energy resources, reduce their energy costs through efficiency and weatherization, and increase energy security for tribes and villages.	CO ₂	Economic	Implemented	DOE	0.065	0.206	0.386
Climate Showcase Communities Grant Program	In 2009 and 2010, EPA awarded a total of \$20 million in grants to help local and tribal governments take steps to reduce GHG emissions while achieving additional environmental, economic, and social benefits.	CH ₄ , CO ₂	Economic; Information	Implemented	EPA	0.03	0.35	0.35
Community Renewable Energy Deployment Grants	Create up to a 50% matching grant for the construction of small renewable energy projects that will have commercial electrical generation capacity of less than 15 megawatts. Types of renewable energy sources include solar, wind, geothermal, ocean, biomass, and landfill gas.	CO ₂	Economic	Implemented	DOE	n/a	n/a	n/a
Tax Provisions	Provide incentives for alternative fuel vehicles and renewable/alternative energy production. Encourage energy conservation, production of renewable energy and energy efficiency manufacturing projects, and carbon sequestration. There are 14 different federal tax provisions for technologies and practices that help reduce GHGs.	CO ₂	Economic	Adopted	Treasury	n/a	n/a	n/a
Interagency Partnership for Sustainable Communities	Encourages integrated regional planning by aligning federal policies for housing, transportation, and the environment.	All	Voluntary, Economic, Information	Implemented	EPA/DOT/ HUD	n/a	n/a	n/a
Center for Corporate Climate Leadership	Serves as a resource center for organizations interested in GHG measurement and management. Previous Climate Leaders Program ended in September 2011 due to the emergence of non-federal actors with similar efforts.	All	Information	Implemented	EPA	n/a	n/a	n/a

Note: n/a (i.e., not applicable) indicates either the value does not apply for the given year or quantifying GHG emissions do not apply.

3. NONFEDERAL POLICIES AND MEASURES

In the United States, local, state, and federal governments share responsibility for the nation's economic development, energy, natural resources, and many other issues that affect climate mitigation. The federal government supports state and local government actions to reduce GHG emissions by sponsoring policy dialogues, issuing technical documents, facilitating consistent measurement approaches and model policies, and providing direct technical assistance. Table 4-3 summarizes key federal programs that provide support to state and local activities across four sectors. Such federal support helps state and local governments learn from each other to leverage best practices, helping reduce overall time and cost for both policy adoption and implementation.

Table 4-3: Federal Programs Supporting State and Local Policies and Measures

The U.S. Government also helps state and local governments learn from each other to leverage policy and program best practices for climate mitigation.

Name	Overview	Sectors	GHG(s) Affected
New On-Road GHG Assessment Tools (EPA)	Supports and encourages state and local governments to estimate future GHG emissions from the on-road portion of the transportation sector and find strategies to mitigate these effects.	Transport	CO ₂
Federal Transit Program (DOT)	Provides communities with the tools to effectively coordinate land use and transportation decisions, as well as provide training in environmental management systems to help transit agencies reduce the environmental impact of their operations.	Transport	CO ₂
Climate Showcase Communities Grant Program (EPA)	In 2009 and 2010, EPA awarded \$20 million in grants through this program to help local and tribal governments take steps to reduce GHG emissions, while achieving additional environmental, economic, and social benefits.	Transport; Energy: Supply, Residential and Commercial; Waste Management	CO ₂ and CH ₄
State Energy Program (DOE)	Provides financial and technical assistance to states through formula and competitive grants.	Energy: Supply, Residential, Commercial, and Industrial	CO ₂
Energy Efficiency and Conservation Block Grant Program (DOE)	Provided more than \$2.7 billion in funding to local and state governments, Indian tribes, and territories to develop and implement projects to improve energy efficiency and reduce energy use and fossil fuel emissions in their communities.	Energy: Supply, Residential, Commercial, and Industrial	CO ₂
Indian Energy Policy and Programs/Tribal Energy Program (DOE)	Provide financial and technical assistance that enables American Indian and Alaska Native tribes to deploy renewable energy resources, reduce their energy costs through efficiency and weatherization, and increase their energy security.	Energy: Supply, Residential, Commercial, and Industrial	CO ₂
Better Buildings, Better Plants Program (DOE)	Shares implementation models among participants, including state and local governments, as a part of its broader efforts.	Energy: Residential, Commercial, and Industrial	CO ₂

Regional Clean Energy Application Centers (DOE)	Promote and assist in transforming the market for CHP, waste heat to power, and district energy technologies and concepts. As part of this work, CEACs provide information on the benefits and applications of CHP to state and local policy makers.	Energy: Residential, Commercial, and Industrial	CO ₂
Industrial Assessment Centers (DOE)	Provide in-depth assessments of a plant's site and its facilities, services, and manufacturing operations.	Energy: Industrial	CO ₂
Weatherization Assistance Program (DOE)	Reduces energy costs for low-income households by increasing the efficiency of their homes and provides technical assistance to local governments.	Energy: Residential and Commercial	CO ₂
Building Energy Codes Program (DOE)	Provides technical assistance to states and localities as they adopt and enforce energy codes.	Energy: Residential and Commercial	CO ₂
Home Performance with ENERGY STAR (DOE)	Provides a directed set of resources to more than 50 Program Sponsors who are represented by local organizations (utilities, state energy offices, etc.).	Energy: Residential	CO ₂

3.1 State Policies and Measures

Numerous state policies and measures complement federal efforts to reduce GHG emissions. A wide range of policies affect the electricity and transportation sectors, from actions that regulate GHG emissions to complementary policies that indirectly reduce emissions. Table 4-4 presents a list of key policies.

Table 4-4: Summary of State Energy Efficiency, Renewable Energy and GHG Policies and Measures

Key Policies and Measures	Number of States
State GHG Emission Targets	29
GHG Performance Standards	4
Renewable Energy Portfolio Standard	29
Energy Efficiency Resource Standard	18

Note: The count is inclusive of mandatory portfolio and resource standards only. Source: U.S. EPA State and Local Climate and Energy Program.

(Insert map of state policies and measures here).

Caption Text: Over half of the country has already adopted GHG mitigation policies at the state level, including GHG emissions targets and performance standards, and renewable energy and energy efficiency portfolio standards.

3.1.1. Carbon Markets Initiatives

3.1.1.1. Regional Greenhouse Gas Initiative⁶⁷

Launched on January 1, 2009, the Regional Greenhouse Gas Initiative (RGGI) is the first mandatory, market-based U.S. cap-and-trade program to reduce GHG emissions. RGGI currently applies to 168 electricity generation facilities in nine Northeast and Mid-Atlantic states, which account for approximately 95 percent of CO₂ emissions from electricity generation in the region. In February 2013, the participating states agreed to significantly revise the program. Under these revisions, CO₂ emissions will be capped at 91 million short tons per year in 2014, a 45 percent reduction from the previous cap of 165 million short tons. The cap will then be reduced by 2.5 percent each year from 2015 through 2020. Under the program, nearly 90 percent of allowances are distributed through auction. As of March 2013, cumulative auction proceeds exceeded \$1.2 billion. Participating states have invested approximately 80 percent of auction proceeds in consumer benefit programs, including investments in state and local government end-use energy efficiency and renewable energy deployment programs.

3.1.1.2. California⁶⁸

California's Global Warming Solutions Act (Assembly Bill [AB] 32) was signed into law in 2006, establishing a statewide GHG emissions limit of 1990 levels to be achieved by 2020. As part of a portfolio of measures implemented to achieve this statewide limit, the California Air Resources Board (ARB) adopted cap-and-trade regulations in 2011. The program established a declining cap limit on emission sources responsible for approximately 85 percent of statewide GHG emissions, including refineries, power plants, industrial facilities, and transportation fuels. In addition to the cap-and-trade program, the portfolio of programs implemented to achieve the statewide GHG emissions limit under AB 32 includes a mandatory GHG emissions reporting program for large emitters, a renewable energy portfolio standard (RPS), and various energy efficiency measures and incentives.

3.1.2. Other State GHG Policies and Measures

3.1.2.1. State Emission Targets

As of August 2013, 29 states had adopted some sort of state GHG reduction target or limit, although these vary in stringency, timing, and enforceability. Statewide GHG targets are nonregulatory commitments to reduce GHG emissions to a specified level in a certain timeframe (e.g., 1990 levels by 2020). Such targets can be included in legislation, but are more typically established by the governor in an executive order or a state advisory board in a climate change action plan.

Statewide GHG caps also commit to reduce emissions in a certain time frame, but are regulatory in nature and more comprehensive than emission targets. These policies can include regulations to require GHG emission reporting and verification, and may establish authority for monitoring and enforcing compliance. An emission cap can be combined with emission trading into a cap-and-trade program.

⁶⁷ See www.rggi.org.

⁶⁸ See <http://www.arb.ca.gov/cc/ab32/ab32.htm>.

3.1.2.2. Performance Standards for Electric Power

As of February 2013, three states (New York, Oregon, and Washington) have GHG emission standards for electric generating utilities, requiring power plants to have emissions equivalent to or lower than the established standard. For example, in New York, new or expanded baseload plants (25 MW and larger) must meet an emission rate of either 925 pounds of (lbs) CO₂ per megawatt-hour (/MWh) (output based) or 120 lbs CO₂/per million British thermal units (MMBtu) (input based). Non-baseload plants (25 MW and larger) must meet an emission rate of either 1,450 lbs CO₂/MWh (output based) or 160 lbs CO₂/MMBTU (input based).

Three states (California, Oregon, and Washington) also have standards that apply to electric utilities that provide electricity to retail customers. These standards place conditions on the emission attributes of electricity procured by electric utilities. For example, in Oregon and Washington, electric utilities may only enter into long-term power purchase agreements for baseload power if the electric generator supplying the power has a CO₂ emission rate of 1,100 lbs CO₂/MWh or less.

3.1.2.3. Integrated Utility Emission Reduction Plans

In addition to state GHG reduction policies, states are finding other ways to reduce emissions. One such way is through Integrated Utility Emission Reduction Plans, where utilities partner with state governments to develop plans to reduce emissions. The most notable example is Colorado's Clean Air–Clean Jobs Act, which requires utilities to consider current and reasonably foreseeable air pollution regulations, and create a plan that could include emission controls, generation plant refueling, or retirement of certain units.

3.1.3. Transportation Policies

3.1.3.1. The Transportation Climate Initiative

The counterpart to the RGGI for the transportation sector is the Transportation Climate Initiative (TCI), a regional collaboration of 12 Northeast and Mid-Atlantic jurisdictions that seeks to stimulate sustainable economic development and improve the environment by supporting innovative technologies and smart planning, and by finding greater efficiencies within the transportation sector. TCI's core work areas are expediting the deployment of electric vehicles and alternative fuels; creating sustainable communities; adopting innovative communications technologies, e.g., to promote public transit and expand the use of real-time information on traffic and alternative routes; and advancing more efficient freight movement. Already, TCI jurisdictions have taken action by forming the Northeast Electric Vehicle Network, and all TCI states have agreed to regional sustainability principles that make sustainable development a top regional transportation goal.

3.1.3.2 California's Senate Bill 375

To achieve the GHG reduction goals set out in California's AB 32, California Senate Bill 375 (SB 375) focuses on reducing VMTs and urban sprawl. SB 375 became law on January 1, 2009, to more specifically address the transportation and land-use components of GHG emissions. SB 375 prompts California regions to work together to reduce GHG emissions from cars and light trucks, and requires integration of planning processes for transportation, land use, and housing. The goal is for integrated planning to lead to more efficient communities that provide residents with alternatives to using single occupant vehicles. Specifically, SB 375 requires the

California ARB to develop regional reduction targets for automobile and light truck GHG emissions for each region. California metropolitan planning organizations, which are traditionally responsible for transportation planning, are tasked with creating a Sustainable Communities Strategy that combines transportation and land-use elements to achieve the emission reduction target set by ARB, if feasible. SB 375 also offers local governments regulatory and other incentives to encourage more compact new development and transportation alternatives.

3.1.4. Renewable Energy and Energy Efficiency

3.1.4.1. Renewable Portfolio Standards⁶⁹

A mandatory RPS requires utilities to supply a certain amount of electricity to customers from renewable energy sources or install a certain amount of electricity generating capacity from renewable energy sources in a set time frame. As of January 2013, 29 states had an RPS.

3.1.4.2. Energy Efficiency Resource Standards⁷⁰

Energy efficiency resource standards (EERSs) require utilities to reduce energy use by a certain percentage or amount each year. Standards can vary, with annual or cumulative targets. As of August 2013, 18 states had a mandatory EERS program in place. The Lawrence Berkeley National Laboratory considers EERS policies to be one of the most significant drivers for state spending on energy efficiency.⁷¹

3.1.4.3. Government Lead-by-Example Procurement Activity

Many state and local governments lead by example by establishing programs that achieve substantial energy cost savings within their own operations and buildings (owned or leased). These lead-by-example programs include energy standards for new buildings, binding usage reductions for existing buildings, and innovations in financing efficiency projects. In addition to reducing state energy bills and emissions, these efforts demonstrate the feasibility and benefits of clean energy and serve as a model to others.

3.1.4.4. Public Benefit Funds⁷²

As of August 2013, 19 states plus Washington, DC, and Puerto Rico have some form of public benefit funds, in which utility consumers pay a small charge to a common fund, often as part of the monthly billing cycle. The utility uses these funds to invest in energy efficiency and renewable energy projects and programs, such as home weatherization and renewable technologies. Existing funds are anticipated to generate \$7.7 billion by 2017.

3.2 Local Policies and Measures⁷³

Local governments are also making a significant contribution to overall GHG reductions in the United States. Actions taken by these local governments are complementary to and supported by state and federal

⁶⁹ See <http://www.dsireusa.org/summarytables/rpre.cfm>.

⁷⁰ See <http://emp.lbl.gov/publications/future-utility-customer-funded-energy-efficiency-programs-united-states-projected-spend>.

⁷¹ See <http://emp.lbl.gov/publications/future-utility-customer-funded-energy-efficiency-programs-united-states-projected-spend>

⁷² See http://dsireusa.org/documents/summarymaps/PBF_Map.pdf.

⁷³ See <http://www.epa.gov/statelocalclimate/local/index.html>.

government policies and programs. While local governments often best understand and can directly control the local factors that influence GHG reductions, the creation and implementation of their reduction policies and programs can benefit from support at the state and federal levels. EPA provides such resource support in many forms, including peer exchange, training opportunities, and planning, policy, technical, and analytical support. The examples listed in Box 4-5 are from EPA's Climate Showcase Communities, a program that works with 50 diverse local governments and tribes to pilot innovative, cost-effective, and replicable community-based GHG reduction projects.

Box 4-5: U.S. Cities as Global Leaders⁷⁴

Eleven U.S. cities are members of C40 Cities, a climate leadership group comprised of 58 megacities from around the world. These cities are implementing innovative and effective policies and programs in buildings, renewable energy, lighting, ports, transport, and waste that can serve as a model to other communities worldwide:

New York, New York: New York Mayor Michael Bloomberg chairs the C40 and was the driving force behind PlaNYC—a plan to reduce greenhouse GHGs 30 percent by 2030. The city has already achieved a 13 percent reduction in greenhouse GHGs by enacting stringent building energy efficiency laws, increasing transit options, and improving infrastructure—all while continuing to grow its economy and addressing climate resiliency in the wake of Hurricane Sandy.

Houston, Texas: Houston has emerged as a new leader on sustainability in recent years. The city was one of five winners of the Bloomberg Philanthropies' Mayors Challenge for an innovative single-stream waste management approach. Houston is the largest municipal purchaser of green power in the country, provides financial incentives for commercial building efficiency improvements, implemented the nation's first municipal electric vehicle fleet-sharing system, and recently expanded the city's pilot bike-share program.

San Francisco, California: San Francisco is on the path to achieving its long-term goal of reducing GHGs by 80 percent from 1990 levels by 2050. Since 2010, San Francisco has reduced its emissions by 14.5 percent below 1990 levels through a combination of initiatives, such as the San Francisco Carbon Fund and Community Climate Action Advisory Panels. San Francisco has the largest municipally owned solar power system in the United States, generating 826 MWh annually; runs one of the largest clean air fleets; and is aggressively pursuing a goal of zero waste by 2020.

Seattle, Washington: Seattle initiated the United States Mayors Climate Protection Agreement in 2005. Now pursuing a goal of climate neutrality by 2050, the city has the nation's first carbon-neutral electric utility, strong green building efficiency mandates, and expansive light rail and transit options, and is working with the private sector to address port-related emissions.

3.2.1 Sustainability and Energy Planning

Local governments are addressing GHG emissions through integrated energy and environmental planning. This approach considers both energy supply and demand to ensure long-range energy policies are both environmentally sensible and economically feasible. El Cerrito, California, is working with neighborhood

⁷⁴ For additional examples of C40 actions, see <http://www.c40cities.org/>.

communities to monitor energy use and identify opportunities for energy savings. By creating a multi-jurisdictional GHG planning and management framework for small communities, El Cerrito is demonstrating how small governments can partner to share resources and best practices. By aggregating resources, these small local governments can overcome barriers to climate change mitigation and achieve economies of scale that make mitigation easier and more cost-effective.

3.2.2 Transportation and Land Use Planning

[insert box 406 near this section 3.2.2]

Local governments are addressing GHG emissions through a variety of transportation and land-use planning initiatives. Salt Lake City, Utah, aims to reduce GHG emissions by reducing VMTs using a community-based social marketing campaign to promote public transit, walking, biking, carpooling, and teleworking. Tompkins County, New York, is creating models in three pilot projects for new building codes, policies, and zoning ordinances to support sustainable development and decrease emissions.

Box 4-6: EPA's New On-Road GHG Assessment Tools

Through providing models, tools, and guidance, EPA supports and encourages state and local governments to estimate future GHG emissions from the on-road portion of the transportation sector, and find strategies to mitigate these effects. To fulfill its mission of protecting air quality and public health, EPA develops on-road emissions models to project future levels of emissions of all types of air pollutants from all on-road vehicles, including cars, trucks, and buses. EPA updated its on-road emissions model, MOVES (Motor Vehicle Emissions Simulator), in 2012. MOVES is a state-of-the-art emissions model that has the ability to estimate GHG emissions of on-road vehicles as well.⁷⁵

In 2011, EPA documented an approach called the Travel Efficiency Assessment Method (TEAM) for assessing the potential of on-road travel efficiency strategies to reduce pollution and GHG emissions. Travel efficiency strategies affect travel activity, such as travel demand management (telecommuting, transit subsidies), public transit fare changes and service improvements, road and parking pricing, and land use/smart growth. TEAM uses regionally derived travel model data and other travel activity information with EPA's MOVES model to estimate emissions reduced. EPA has developed a guide for planners to apply the method locally.⁷⁶ EPA also released information on transportation control measures that have been implemented across the country for a variety of purposes, including reducing criteria pollutants and GHGs.⁷⁷

3.2.3 Sustainable Materials Management

Reducing solid waste through sustainable materials management is a method that communities are undertaking to reduce GHG emissions. The Alameda County Waste Management Authority in California has launched a project to reduce limited-use transport packing materials (such as wooden pallets and cardboard boxes) by helping businesses convert to sustainable and reusable alternatives. Switching to reusable alternatives not only reduces solid waste, but also reduces GHG emissions from raw materials extraction and the production, transport, and landfilling of packaging.

3.2.4 Residential Energy Efficiency

⁷⁵ The MOVES and associated documentation is found at <http://www.epa.gov/otaq/models/moves/index.htm>.

⁷⁶ See <http://www.epa.gov/otaq/stateresources/ghgtravel.htm>.

⁷⁷ See <http://www.epa.gov/otaq/stateresources/policy/430r09040.pdf>.

Considering the sizable contribution the residential sector makes to overall GHG emissions, residential energy efficiency measures represent an important strategy for reducing emissions. Many communities are making efforts to improve residential energy efficiency in a variety of ways. For example, Durham City-County, North Carolina, is instituting a neighborhood-based residential energy efficiency program targeting at least 344 residences. By leveraging existing neighborhood relationships, focusing on streamlining the residential upgrades, and targeting households ineligible for other retrofit funding, Durham has demonstrated an effective strategy to achieve cost-effective and timely reductions of GHGs.

3.2.5 Energy Efficiency in Government Operations

Improved energy efficiency in local government operations also represents a way communities can lead by example and reduce their GHG emissions. The Delaware Valley Regional Planning Commission is providing training assistance to the governments of small and medium-sized municipalities in four suburban counties in southeastern Pennsylvania to develop and implement strategies to reduce energy use and GHG emissions associated with their operations.

3.2.6 Commercial Energy Efficiency

Communities are also reducing emissions by improving energy efficiency in the commercial sector. The Tri-County Small Business Efficiency Program is working to educate small business owners in three counties in Montana about strategies to reduce their energy and water use. The program is also helping small business owners make energy efficiency improvements by partnering with local energy and water utilities to offer free energy audits and financial assistance to implement audit recommendations.

A growing number of communities (including Austin, New York City, Seattle, San Francisco, Philadelphia, and Minneapolis) have adopted policies that require mandatory benchmarking and disclosure of commercial building energy use using EPA's Portfolio Manager™. Mandatory benchmarking allows building owners to compare energy use and efficiency among comparable buildings, and mandatory disclosure provides information on energy use for potential building purchasers and renters. The availability of this information highlights the value of energy efficiency in the commercial building market.

3.2.7 Renewable Energy Programs

Renewable energy programs reduce GHG emissions by providing energy from nonemitting and lower-emitting sources of energy, such as solar, wind, geothermal, and low-impact hydropower. Many communities are realizing the benefits of utilizing renewable energy. For example, West Union, Iowa, is installing a geothermal heating and cooling system for six blocks of the downtown area. When finished, this system will provide heating and cooling to 80 percent of the building space in this area.

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